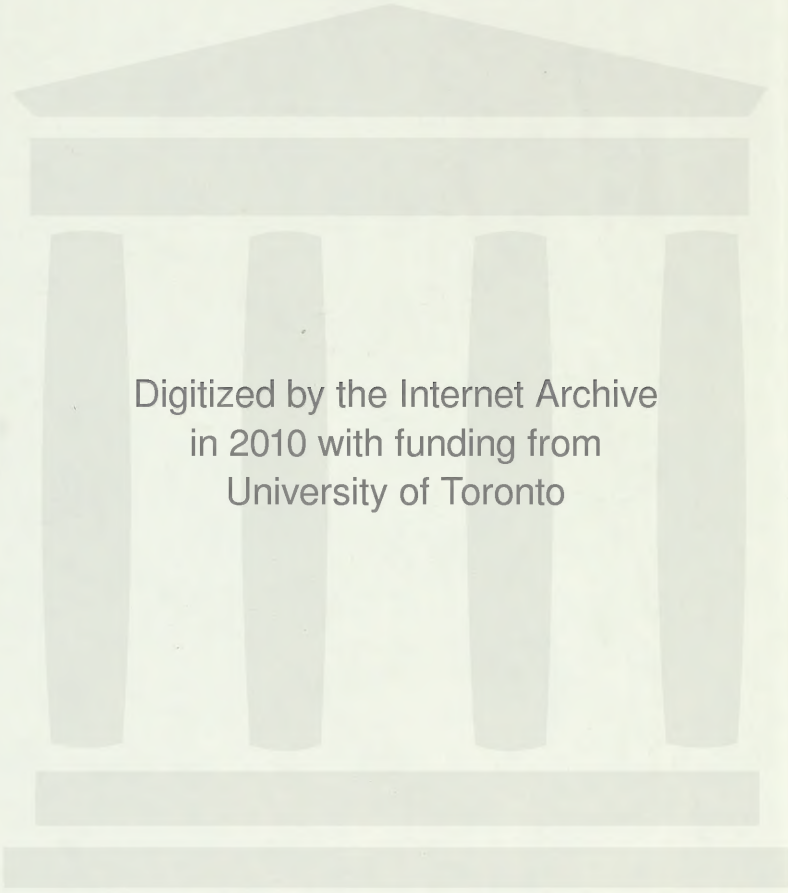

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The Surveyor

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Minutes of Proceedings.

A Red Christmas.

[illegible] heads of certain [illegible] strong and [illegible] of practice seems [illegible] for [illegible] year [illegible] earth and the goodwill of man to [illegible] over-loaded with the [illegible] of social [illegible] Little [illegible] happiness [illegible] increased [illegible] associated with the close of 1914 and [illegible] should [illegible] of Peace

[illegible] of the previous year [illegible] Over the [illegible] and red [illegible] Lies [illegible] [illegible] [illegible] Give [illegible] Christmas Day [illegible]

And [illegible] [illegible] [illegible]

modation for persons of the working class, and that in districts in respect of which we are asked to sanction loans for the provision of such accommodation under Part III. of the Act of 1890 the provision of the dwellings is generally proposed as a course precedent to and not subsequent to the closure of insanitary houses." That part of the report concerned with the building of houses by local authorities will be dealt with in a separate article next week.

* * *

War and the Pollution of Water Supplies.

An entirely new condition has arisen in this country as the result of the present war, and it is one to which we wish to call the serious attention of all water engineers and others interested in safeguarding our water supplies. At the present time in all parts of the country large camps are being established for the accommodation in various places of hundreds of thousands of men and possibly for the future accommodation of millions. In some cases the men still live under canvas, but the policy of constructing permanent buildings of corrugated iron has been adopted, so that it is quite evident that settlements of a permanent character will be established. In travelling through the country by road in almost any direction one comes across these Government establishments in the most unexpected places. Further, we find hospitals for the sick and wounded which have been hurriedly constructed, or hotels and other buildings which have been adapted for the purpose. It is clear in the first place that where there is a permanent settlement with a population reckoned by tens of thousands a large water supply is a necessary preliminary, and that a daily flow of sewage of considerable volume must be produced. This sewage must be dealt with hurriedly, and it is inevitable that at a very early stage drainage and sewage disposal must become necessary. The difficulty of hastily providing such arrangements for a camp of, say, 30,000 soldiers must be very great, and we are at once faced with the absolute certainty of the pollution of rivers and of sources of water supply suddenly at all sorts of unexpected places.

It is unnecessary to go into the matter in great detail, as each engineer has probably an object lesson in his own district. Such possibilities of contamination cannot be avoided. One cannot expect that in war-time, under conditions entirely new, when all kinds of unusual difficulties as to the carriage of material, the employment of labour and the supervision of work have to be faced, the sewage of camps and temporary hospitals will be treated immediately upon the best and most approved principles. The time available is insufficient to make such treatment possible at the outset. Pollution of supplies cannot be prevented, but on the other hand, happily, it is possible by the intelligent application of modern methods to treat water in such a manner that, however serious the pollution may be, such pollution may be entirely removed, so that it may be rendered safe for the consumer. If, therefore, any sickness or trouble results from the new conditions brought about by the war, as referred to above, the water authorities will be entirely to blame. The War Office has grasped the importance of sterilising the water supplied to the troops, as did the Japanese in their great war with Russia, when for the first time in history the proportion of the sick to the wounded was reversed. We hear of the steps taken by the Government thus to purify the water supplied to the soldiers, but we also hear of something better made by the contractors to build retreats of the Army, and that although many of the men are enduring great discomfort and hardship owing to the wet weather and to the difficulties inseparable from the sudden call to arms. If it is thus possible suddenly and unfailingly to produce large supplies of pure water to the troops, it should be plain that there can be no possible excuse for any water authority supplying polluted water to its consumers.

We see that the chances of pollution are greatly increased, and it follows that there ought to be an increased vigilance on the part of the water authorities. It is essential that constant examinations should be made, and that steps should be taken in order that such treatment as may be found to be necessary may be ready for immediate application. It is only by such vigilance that we can hope to escape from serious danger. It should be remembered that as time goes on the chances of enteric patients entering the hospitals must increase; we may also have wounded soldiers of other nations, who may well be carriers of disease. We hear of typhoid and cholera at the Front, and we must be prepared as the year advances to hear of more, and to be ready to deal with cases occurring at home. Many of the camps and hospitals exist in rural districts where water is derived from surface wells, and here the case is one to which the local authority must look with the greatest care. Let it not be imagined that earth treatment is an unfailing remedy. Where the excretion of thousands of men is daily dumped on to the ground in a mass in any form there will be acute danger of the rain water washing pollution into the sources of supply. The greatest care should therefore be exercised in the cartage of this material and in its disposal. Such matters are liable to be overlooked till trouble occurs. The present danger is therefore acute.

* * *

Rationé Tenuræ Roads.

Having regard to the resolution recently passed by the Annual Conference of Rural District Councils (referred to at p. 567 *ante*), as to the necessity for legislation dealing with the question of *ratione tenuræ* roads, it may be of interest to consider briefly the principles of the liability for the repair of such roads, and the powers of highway authorities with regard to them. In the first place, the nature of the liability is a matter of some uncertainty. Some authorities have held that it is a species of prescription or immemorial usage, others that it may be regarded as a condition annexed to the grant of lands, whether by a subject or by the Crown. But this point is somewhat academic. A more practical question is how can the liability be proved to exist in a particular case. No hard-and-fast rule can be laid down applicable to all cases, but there is authority for saying that if an occupier of land and his predecessors have for a great length of time actually repaired a highway, this, in the absence of explanation, will be almost conclusive. At all events, it will give rise to a strong presumption. But there may be circumstances which will rebut the presumption, such as proof that the repairs were done under a mistaken notion of liability, or that the repairs were ex gratia, and were done on the occupier's land. It would appear, too, that if it can be shown that the liability originated within the time of legal memory (that is to say, after the first year of the reign of Richard I.), this is fatal, because it negatives the theory of immemorial usage on which the presumption rests. This is illustrated by a case in which a road had been repaired by the occupiers of certain land as far back as being within living memory, but this road was on the top of a hill, consisting of earth excavated from the top and down which it had been made, and was clearly of a grant of the land by Charles I. Therefore the presumption of liability was rebutted (*Rex v. Hudd*, 4 B. & A. 73). As to the person

Road Improvements and Road Board Funds.

Sewage Works Operation and Analytical Methods.

Patriotism or ?

Sewage Works Operation and Analytical Methods.

Appointed in 1913 to deal with the question of analytical methods employed in connection with sewage works operation, a committee of the Sanitary Engineering section of the American Public Health Association have recently presented a progress report, which we reproduce herewith with a cordial invitation to our readers either to discuss the suggested outline of tests in our columns or to communicate their views to the chairman of the committee, Mr. W. L. Stevenson, whose address is 412 City Hall, Philadelphia. The personnel of the committee is as follows:—Mr. C. B. Hoover, chemist-in-charge of the sewage treatment works of Columbus, Ohio; Mr. H. C. McRae, division engineer in charge of the sewage treatment works of Baltimore; Mr. Langdon Pearse, division engineer in charge of the sewage disposal investigations being conducted at Chicago; Professor George C. Whipple, consulting engineer of New York, and Professor of Sanitary Engineering at Harvard University; Mr. W. L. Stevenson, assistant engineer in charge of the sewage disposal investigations being conducted and the works now in operation at Philadelphia. The committee is not taking up the methods to be used in making the tests but rather as engineers are aiming to standardise what shall be done, leaving to the committees of the laboratory section of the American Public Health Association the technique of the tests.

PART I.—SEWAGE WORKS OPERATION.

The introduction of sewer systems into modern cities whereby the wastes of domestic life and industry are discharged into watercourses has brought about the need for the treatment of sewage in order to accomplish two purposes:

(*a*) To promote the comfort and convenience of the people by maintaining watercourses in a decently clean condition that is, free from nuisance to sight or smell, so as to be fit for civic development, industry and recreation.

(*b*) To aid in protecting the public health when necessary by maintaining watercourses as fit sources of water supply after adequate purification, or for the cultivation of shell-fish.

The initiative for installation of sewage treatment works usually is either

(*a*) The recognition by a community of the fact that nuisances in watercourses retard municipal developments, deprive the citizens of their use of the streams, and offend common decency.

(*b*) An order from a properly empowered body for the installation as a sanitary measure for the protection of the users of the watercourses.

The design and extent of the works and the degree of treatment required should be such as to promote economy of funds in order to give the greatest benefit to the largest number of people at the least cost.

Based upon these premises, the operation of a sewage treatment works may be judged by the following standards:

(*a*) Prevention of nuisance either at the works or in the body of water receiving the effluent.

(*b*) Protection to the public health—*e.g.*, in reducing the pollution in a watercourse to relieve the load on a water purification plant.

In the following discussion it is assumed that, under the guidance of competent sanitary engineers, the specific problem has been studied, resulting in the design and construction of efficient sewage treatment works, and upon the completion the owner is confronted with the problem of its operation and maintenance.

One of the first and most important matters to be considered in the operation of a sewage treatment works is the heterogeneous nature of sewage. Its composition varies widely in different towns, influenced by the ways of living and amount and kind of industrial wastes. Some works receive a sewage so fresh that original fæcal matter, paper and fats are practically unchanged, while in others the solids have disintegrated and partly dissolved.

The hourly character and composition of the sewage may also vary from day to day, being uniform in one place and different in another. During storms the sewage collected by a combined system of sewers is increased in volume and its composition changed to a very marked degree.

Many of the forces of Nature are utilised in sewage treatment in an involved and complex manner. Gravitation is utilised in sedimentation and in the hydraulics of the flowing liquids; chemical reactions occur in the use of precipitants, in disinfection, and in the changing combinations of sewage materials; and biological forces are active in the digestion of sludge and in the oxidation of the dissolved organic matter.

In successful operation all of these factors must be controlled. It is therefore self-evident that sewage treatment works, particularly of any size, cannot be made automatic, but require constant observation and supervision by trained, skilled operators in order to accomplish the purpose for which the plant was installed and the funds invested.

The degree of technical skill required depends upon the following factors, but not necessarily in the order given:

(*a*) The magnitude and design of the works.

(*b*) The processes used.

(*c*) The composition of the sewage treated.

(*d*) The receiving body of water.

It does not always follow because a sewage treatment works receives a large volume of sewage that the responsibility is in proportion to the magnitude, because the processes used may be simple and the dilution of the effluent large. Some small works, for particular purposes (*e.g.*, fat recovery) may require very expert supervision.

The use of biological works for oxidation or the use of disinfection always requires more attention than simple sedimentation. Emscher tanks which include sedimentation and sludge digestion in a single device require a higher degree of skill to operate than plain sedimentation tanks. The presence of considerable volumes of trade wastes in sewage usually introduces difficulties not encountered with ordinary domestic sewage.

Constant attendance upon a sewage plant for a private estate or small institution is unnecessary. Such plants should be simply designed, so that an employee with other duties is required to give but a small part of his time to the care of the plant. But in such cases successful results are not always obtained unless the designing engineer or some competent person is called in at regular times to inspect and advise concerning the technical details of operation. Such inspections are particularly important during the early life of the plant to train the attendant to observe and interpret the conditions which require attention.

For the larger institutional plants and works for small towns more skilled attendants are required, and the need for competent supervision is more urgent.

In municipal sewage treatment works of any magnitude the constant services of a scientifically trained man in charge is practically essential to success. The larger volumes of sewage treated afford greater potentialities for the creation of nuisance from bad odours if the works are not constantly kept in the best condition. The effect upon the receiving body of water is also greater, and a deterioration in the quality of the final effluent may allow the development of conditions such as nuisance in the watercourse, or danger to water supplies, which it is the very function of the works to prevent. And, finally, it is economical to pay a liberal salary to the right kind of man to keep the annual charges for operation and maintenance at a minimum figure by business-like management.

The keeping of careful, thorough and neat records of operation is essential to efficient operation. State authorities charged with supervision over the condition of the watercourses should require a uniform record. Such records, from the operating point of view, show the effect of changing methods of operation, and enable the selection of the most efficient and economical procedure. Complaints of citizens can frequently be answered and explained away by

[illegible] and often skilled [illegible] have previously [illegible]

A[illegible] example of the [illegible] of [illegible] [illegible] applied to [illegible] [illegible] A [illegible] [illegible] works required to provide the [illegible] of [illegible] in a chemical laboratory [illegible] of water supply. [illegible] [illegible] [illegible]

should, however, be considered in connection with either the results of the tests designated X or relative stability, for the presence in the sample of sufficient decomposable matter might exhaust in a short time the dissolved oxygen found by the analysis.

Relative Stability: Methylene Blue.—This test has a definite value in connection with the dissolved oxygen and nitrate tests in explaining the records of past operation, but its greatest value is as a control for small works. Obviously, many small works cannot be kept under the continual observation of a trained chemist or engineer, and in such cases the relative stability test can be readily made by an attendant incapable of the more elaborate procedures. Under these conditions relative stability is of primary importance, and its daily use is strongly recommended in preference to occasional tests of other kinds.

Caution should be used in regard to the relative stability of tank effluents, sterile effluents or effluents containing certain industrial wastes.

Tests of Sludge.—(*a*) Specific gravity, (*b*) percentage moisture, (*c*) percentage of the dry residue that is volatile, (*d*) reaction—alkalinity or acidity.

These tests made on sludge, especially from two-story tanks and separate sludge-digestion tanks, are of great value in operation, as they interpret the biological digestion of the organic matter. The reaction test is particularly important as an aid in detecting the cause and pointing out the remedy for poor sludge production. It has been found that tanks producing bad sludge can be made to produce good sludge by adjusting the reaction from acid to alkaline.

In sludge obtained from fine screening it is advisable to determine the weight per unit volume and percentage moisture.

Bacteria: Presumptive Tests for B. Coli.—For sewage treatment works intended solely to prevent nuisance in watercourses, tests for bacteria are superfluous.

They are, however, of the utmost importance in cases where the works are intended to protect sources of water supplies or shellfish layings.

It is unnecessary to carry on the confirmatory tests

TESTS FOR DETERMINING THE COMPOSITION OF CRUDE SEWAGE FOR COMPARISON.

Occasional composite samples to be analysed for nitrogen as organic and as free ammonia, at same time samples to be examined for avidity for oxygen test called X in report.

FOR SEWAGE TREATMENT WORKS PRIMARILY DESIGNED TO PREVENT NUISANCE.

Type of works.	Tests for operating control and determination of efficiency.					Tests to determine sufficiency of treatment
	Influent and effluent of preliminary processes.	Sludge drawn from		Effluent of oxidation process.	Final effluent as discharged into the receiving body of water.	Receiving body of water.
		One-story tanks.	Two-story tanks.			
Works consisting of preliminary processes only such as fine screens or sedimentation	(1) Test for the avidity for oxygen called X in text (2) Test for suspended matter called Y in text	(1) Specific gravity (2) Percentage moisture in wet sludge (3) Percentage of dry residue that is volatile	(4) Reaction of wet sludge		(1) Test for avidity for oxygen called X in text (2) Test for suspended matter called Y in text	(1) Dissolved oxygen (2) Test for avidity for oxygen called X in text
Works consisting of preliminary and oxidation processes such as contact beds or percolating filters				(1) Nitrogen as nitrates (2) Test for the avidity for oxygen called X in text (3) Dissolved oxygen (4) Relative stability*	(1) Test for avidity for oxygen called X in text (2) Nitrogen as nitrates (3) Dissolved oxygen (4) Test for suspended matter called Y in text (5) Relative stability*	

FOR SEWAGE TREATMENT WORKS PRIMARILY DESIGNED TO PROTECT SOURCES OF WATER SUPPLY.

Type of works.	Tests for operating control and determination of efficiency.					Tests to determine sufficiency of treatment
	Influent and effluent of preliminary processes.	Sludge drawn from		Effluent of oxidation process.	Final disinfected effluent as discharged into the receiving body of water.	Receiving body of water.
		One-story tanks.	Two-story tanks.			
Works consisting of preliminary processes and disinfection	(1) Test for the avidity for oxygen called X in text (2) Test for suspended matter called Y in text	(1) Specific gravity (2) Percentage moisture in wet sludge (3) Percentage of dry residue that is volatile	(4) Reaction of wet sludge		(1) Presumptive test for B. coli (2) Test for avidity for oxygen called X in text (3) Test for suspended matter called Y in text	(1) Presumptive test for B. coli (2) Dissolved oxygen (3) Test for avidity for oxygen called X in text
Works consisting of preliminary and oxidation processes and disinfection				(1) Nitrogen as nitrates (2) Test for avidity for oxygen called X in text (3) Dissolved oxygen (4) Relative stability*	(1) Presumptive test for B. coli (2) Test for avidity for oxygen called X in text (3) Nitrogen as nitrates (4) Test for suspended matter called Y in text (5) Relative stability* (6) Dissolved oxygen	

* In small plants not provided with a laboratory relative stability may take first place.

The formation of gas or the red colonies having appearance of *B. coli* on Litmus Lactose Agar at 37 deg. are both in successful use for this purpose.

When used, the test should primarily be made on the receiving body of water, and secondarily on the effluents from disinfection processes.

TESTS OF CRUDE SEWAGE FOR COMPARISON.

For the purpose of record and comparison also it is advisable to make at intervals tests upon composite samples of the crude sewage received at the works. These tests should indicate the character, condition and strength of the sewage.

It is recommended that at least the following determinations be made

(1) Test for suspended matter, called Y above.
(2) Test for avidity for oxygen, called X above.
(3) Nitrogen as organic.
(4) Nitrogen as free ammonia.
(5) Chlorine.

Special cases may require other tests to show the characteristics of the sewage.

Particular attention is called to the notes on Test X dissolved oxygen and bacteria in connection with the receiving body of water. Tests, when applied to sewage and effluents are of value as tools for operating control, but as a measure of sufficiency of treatment they do not always supply adequate information. This is on account of the difficulty of establishing precise standards for effluents discharged into different kind of receiving bodies of water and therefore the final criterion of sufficiency of treatment usually rest in the effects produced upon the receiving body of water considered in the light of expediency and local needs. Investigations of the effects of effluents on bodies of water are therefore urgently recommended.

For the different purposes of operating control, determination of efficiency and determining sufficiency of treatment, the tests commented upon above are grouped in a diagrammatic table submitted herewith.

CONCLUSION.

The committee wish to express their thanks and appreciation to Mr. F. E. Daniels for valuable services rendered in the preparation of this report.

One of the functions of this committee is co-operation with the laboratory section. It is therefore recommended that the proper committee of that section take up for consideration the improvement of the test for suspended matter in sewage called Y in this report, and that during the coming year analysts direct their attention to the simplification and standardisation of the test for avidity for oxygen, called X in this report.

OXFORD CITY ENGINEER'S DEPARTMENT.

The question of the reorganisation of the engineering department of the Oxford Corporation and the construction and maintenance of the roads has been before two meetings of the General Purposes Committee within the last few days. As a result of their deliberations, a report presented by the Staffs Committee was the *Oxford Chronicle* states adopted. The proposed, in the first place, that the whole control of the engineering department, including the construction and maintenance of the roads, should be placed in the hands of one person, to be called the city engineer. It was further proposed that, having regard to the onerous character of the work in contemplation, the interests of the city would best be met by the appointment of a new city engineer, but in order that the corporation might profit by Mr. White's long experience and valuable advice, and also as a mark of appreciation of the great service he has rendered to the city during the last forty-four years, that he should be appointed consulting engineer at a salary of £500.

The committee also recommended that the street cleansing and watering and removal of house refuse be transferred from the sanitary department to the department of the city engineer, and that the salary of the newly appointed city engineer be fixed at £600 per annum, rising to £800. The report, which was discussed at considerable length, was considered at a special meeting of the city council.

The amendment by which the report was defeated at the council meeting virtually proposed that no change should be made in the highways management, but that the Road Board should be consulted with the view to adopting improvements in road making and maintenance. It was also understood though this was not embodied in the amendment—that a new road foreman should be appointed.

By-laws.—Mr. Roden Dixon, borough surveyor of Stratford-upon-Avon, would be glad to hear from surveyors of towns where by-laws with respect to new streets, drainage, buildings, &c., have been approved by the Local Government Board during the past few years.

CORRESPONDENCE.

PURIFICATION OF DAIRY WASTES.

To the Editor of THE SURVEYOR.

SIR,—With respect to your leader "Purification of Dairy Wastes," I have perhaps not made it quite clear that the reduction in volume of wastes from dairies should be effected *before* tank treatment. [illegible] to dilute the tank liquor with a proportion of the clean waters before filtration.

As regards precipitation, a large proportion of the polluting substances occurring in dairy wastes are in solution, and certain precipitants throw down an appreciable portion of the soluble solids, thereby effecting a material reduction in the strength of the liquid to be filtered, and *then* is the time to dilute, if necessary.

It must be borne in mind that the total annual volume of waste turned out from a dairy is not large; further, that many dairies do not work all the year round, so that the cost of precipitants is not heavy, as would be the case in dealing with sewage. Thus, a dairy turning out daily some 6,000 gallons of waste will produce, at the very outside, some 2,000,000 gallons yearly, and a dose of about 16 grains of precipitant per gallon is equivalent to 1 ton of precipitant.

The provision of a percolating filter 12 ft. deep, served by gravitation, might present difficulties in this country, especially as creamery sites are usually selected at or near to important cross roads; but with most creameries there is a great deal of waste heat, which could usefully be employed in pumping the waste liquors. In Ireland and Scotland there is often ample available fall. Difficulty in the matter of storage can be obviated by gravitating or pumping direct to quiescent tanks provided with draw-off [illegible]

[illegible] 2,000 parts per 100,000 of dissolved oxygen in five days requires as long a duration of contact with the filtering material as can be obtained, and by the use of precipitants a finer grade of filtering medium can be employed, and hence enhanced duration of [illegible]

I trust some useful discussions may result from the article.—Yours, &c.,

G. BERTRAM KERSHAW, M.A.M.Inst.C.E., M.Inst.W.E.

9 Victoria-street,
Westminster, S.W.
December 28, 1914.

CHISWICK TRAFFIC CENSUS.

To the Editor of THE SURVEYOR.

SIR,—I see you are interested in the report of the traffic census of the Great Western Road in your issue of November 6th, and I would esteem it a great favour if you would let me know, either by letter or by publication in THE SURVEYOR, what is the width of the street or highway on which this traffic census was taken, as I believe many other road engineers would also like to have this question answered.

In our traffic census we are reducing the traffic to foot-tons, and I would like to reduce the traffic on your Great Western Road to the same unit. Our assumed average weights are practically the same as you used in the Chiswick census.—Yours, &c.,

F. H. JOYNER,
Road Commissioner.

Road Department,
Los Angeles,
California.
December 7, 1914.

[We have submitted the above to Mr. Edward Willis, the engineer and surveyor to the Chiswick Urban District Council, by whom the traffic census referred to by our correspondent was prepared, and have been favoured with the subjoined reply.—ED.]

SIR,—I have to thank you for your communication of the 22nd instant enclosing a letter from the Chief Road Commissioner of Los Angeles, which I herewith return.

It is rather interesting and complimentary to know that your periodical has such a wide circulation, and

is also found so useful at the other extremity of the globe.

I have much pleasure in giving you the following information: Width of carriageway where census was taken, 40 ft. 11 in.; maximum width, 49 ft. 2 in.; minimum width, 30 ft. 10 in.; tramway width (largely excluded from the other traffic), 16 ft.—Yours, &c.,

E. Willis.
Town Hall, Engineer.
Chiswick.
December 23, 1914.

SEWAGE TREATMENT BY AERATION.

To the Editor of The Surveyor.

Sir,—With regard to the above, how is this process going to be affected by the passage of storm water and sewage through the tanks up to, say, three times the average dry-weather flow? Dr. Fowler has rightly said that the conditioning factor (or words to that effect) is cost. I have recently had a letter from an eminent New York engineer, in which he says: "The borough of Brooklyn has been carrying on experiments for several months under Geo. P. Hammond, and, I believe, have found in general that to produce a good effluent this—*i.e.*, aeration—has to be kept up about two hours (agreeing with Fowler), and that this would cost as much in practice as probably to throw it out of the race with other methods. Perhaps some more efficient method will be found some time, cheapening the process."—Yours, &c.,

G. Bertram Kershaw, m.am.soc.c.e., &c.
9 Victoria-street,
Westminster, S.W.
December 28, 1914.

CHARGING FOR WATER SUPPLY.

To the Editor of The Surveyor.

Sir,—Under "Things One Would Like to Know," in your issue of December 25th, the contributor of those most readable notes asks if it is not "rather a bogey to assume that, if water were supplied by meter, an insufficient quantity for sanitary purposes would be used." It is a bogey, and it could easily be disposed of by supplying free a minimum quantity sufficient for sanitary needs, and charging, per meter, for all used beyond that quantity. The illogical absurdity of basing the charge upon rateable value is shown by the assessments imposed in the City of London, where costly office properties use far less water than is used in a small middle-class villa with a bath and a garden.—Yours, &c.,

A Victim.

December 26, 1914.

A Glossary of Road Terms (By H. Percy Boulnois, m.inst.c.e., St. Bride's Press, Limited, 24 Bride-lane, E.C., Price 2s. nett).—The movement towards standardising the principal roads throughout the United Kingdom has rendered it necessary to correlate the nomenclature of road terms in use in different districts, and Mr. Boulnois has compiled a glossary with the hope that it may form a basis for such a correlation.—*Times Engineering Supplement.*

Motor-cycle Allowances.—The question of an allowance for a motor cycle for the surveyor to the Pewsey (Wilts) Rural District Council was discussed at a recent meeting. The surveyor wrote thanking the council for their consideration of his application, but pointed out that he could not provide and run a motor cycle upon £25. Mr. Jeans expressed the opinion that it was absolutely necessary for the surveyor, if he was to exercise an effective supervision of the roads in the outlying parts of the district, to have a motor bicycle. The money, he said, would be well spent. He would move that the surveyor be allowed £35 a year, so that he might provide himself with a motor bicycle, and pay all expenses attaching thereto. Mr. May supported. He was sure, he said, it would be to the advantage of the council. They had 125 miles of road in the district, and it was obvious that the surveyor could not give adequate supervision to that area if he had to get about the district on an ordinary bicycle. They were paying their surveyor a miserable salary; any ordinary clerk could get £90 a year, and by adding £30 a year for a motor bicycle they would then only be paying £120 a year. Eventually the amended proposition to vote £35 was agreed to.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Why is it that in nearly all cases municipal surveyors receive very inadequate remuneration for the services they render their country? Is it because there is no scale by which members of councils can decide what would be a reasonable remuneration to pay their surveyor, having regard to the size of the town or community? How would a suggestion that a salary of £20 per annum for every 1,000 inhabitants work out? And would this suggested scale fairly meet all cases? Will some of the readers of The Surveyor discuss this question?

* * * *

Is not the value of the estate of the late Mr. A. J. Valentine, a civil engineer, a melancholy example of how little grist comes to the millers of this profession? It appears from the daily Press that this gentleman wrote his will in red ink on the back of a cigarette card, and that the total amount of his estate was only £89. How many civil engineers are there who could compete with the deceased gentleman in the small compass of their wills, the lurid colour of the writing, and the amount of the legacy?

* * * *

Is not the Institution of Water Engineers to be congratulated on their generosity in presenting fifty guineas to the Prince of Wales' Fund, twenty guineas to the funds of the Red Cross Society, and thirty guineas to the Belgian Relief Fund? Is it not a pity that the lack of funds or other reasons prevent other institutions and societies from following this excellent example?

* * * *

How many sewage works managers have been troubled with dairy wastes in this country? Is it not notorious that where there is an excess of such wastes in the sewage there is considerable difficulty in obtaining even a "passable" effluent? Will not Mr. Kershaw's series of articles on the purification of dairy and other wastes, which commenced in last week's issue of The Surveyor, prove of considerable assistance both to engineers and to managers in dealing with the problems that present themselves?

* * * *

Is it not rather plucky of the Scarborough Town Council, and an indication of the British character, that, notwithstanding the recent wanton bombardment of the town by the Germans and the damage then caused, they are proposing to erect some bungalows and a shelter in the South Cliff Gardens at a cost of £1,260? Is this not quite the right spirit, whatever reverses we may suffer?

* * * *

Apropos of this spirit, how many people have read in the *Times* of the 26th ult. an account of the splendid sermon preached by the Rev. W. McCarthy, of St. Peter's, Great Yarmouth, with reference to the recent coast raids, in which he says, *inter alia*, "No patriot will hesitate to admit that the destruction of the towns on the East Coast would be a small price to pay for the safety of England and the Empire"? And is not the following also very true: "We have said much in the past about the heroism of those who have been killed in the trenches, but if it has been anything more than talk we shall now nerve ourselves to face possible loss of life, and to have our own names inscribed on the roll of honour"? Would it not be well if all parsons were imbued with this fine spirit at the present juncture?

* * * *

Is it a fact that at a recent meeting of the Merton Urban District Council it was reported that Mr. P. M. May, the accountant, who had been admitted a member of the Officers' Training Corps, had withdrawn from it in consequence of an informal expression of opinion by certain members of a committee? And is it true that as a sequel the council considered the matter, and came to the decision *not* to permit heads of departments to join any branch of H.M. Forces "in view of the importance of local government work"? Would not one have thought that the strengthening of our fighting forces, on which the very life of the nation depends, was also of some importance? How would a German bomb, dropped on the council offices one day, affect these councillors' views?

The Provision of a Municipal Water Service.*

By LEWIS MITCHELL, M.I.M.C.E., M.I.C.E., Waterworks Engineer, Bolton.

(Conclusion.)

The calamity due to bursting of [illegible] recently [illegible] being [illegible] by the failure of the Dale Dyke reservoir, belonging to the Sheffield Corporation, by which over 800 lives were lost, and the engineers were indicted for damages exceeding £500,000. [illegible] America, where [illegible] been more frequent, and the failure of reservoir banks [illegible] the Williamsburg, the Johnstown dam and the Austin dam show to what disastrous consequences a neglect of proper precautions as to the foundations and puddle trenches or provision as to floods may lead. And yet so little is the possibility of disaster by the bursting of a reservoir appreciated that in the Model Water Bill, which is framed for the case of a local authority being the undertakers, no section is provided dealing with damage which may be caused thereby, although it is usual to include in Acts authorising the construction of waterworks a special clause for the protection of millowners and landowners making the undertakers responsible for damage caused by the bursting of the reservoirs or aqueducts. There are, however, very notable exceptions, such as the Liverpool Corporation Waterworks Act, 1880, authorising the Vyrnwy scheme, in which no bursting clause occurs, and in the Bury Corporation Waterworks Act, 1888, the [illegible] on account of the proviso at the end thereof—viz., "provided that no obligation or liability shall attach to the corporation in respect of an injury occasioned by [illegible] corporation or any defect in the works."

From the reservoir or other source of supply the water is conducted by a conduit such as a tunnel or [illegible] under pressure [illegible] by the other. It may be delivered into a service reservoir, and from thence distributed to the town, as in the case of Manchester and Glasgow, or delivered direct to the district of supply without the intervention of a service reservoir, as is usual in comparatively small undertakings, or is conveyed to filters and after purification [illegible] as in the case of Bolton.

There can be little question as to the desirability of filtering water before it is finally delivered to the consumer. While the action of prolonged storage in reservoirs is undoubtedly beneficial, inasmuch as by sedimentation the suspended matters, living and dead, subside, and the risk from pathogenic organisms, which may have been originally present, is greatly diminished, it is in most cases difficult, if not impossible, to ensure that the water has been stored sufficiently long to render it safe. The effect produced by the Lake of Geneva on the waters of the Rhone which pass through it, and of Loch Katrine on the water supplied to Glasgow, and by other large expanses of fresh water, are familiar instances of the purification of waters in a natural way; but in relatively small reservoirs, such as those of the Bolton Corporation, solid matter in a minute state of subdivision may, especially under certain conditions of the reservoir, pass through the outlet valves within a few hours of its entrance, and the clarifying effect of such storage is far from being adequate. If the water drawn from any of our local reservoirs were sent for only a few hours into the town without filtration there would be an immediate outcry. Anyone who has seen samples of unfiltered and filtered water side by side will readily admit the desirability of filtration, if only because of the greatly improved appearance of the filtered water, apart from any question of increased bacterial purity.

There are two kinds of filters—viz., slow sand and pressure or mechanical—and both kinds are to be seen in Bolton. A sand filter consists essentially of a watertight basin or tank containing a layer of fine sand from 2 ft. to 3 ft. thick, supported by a layer of gravel or broken stones in graduated sizes from 6 in. to 12 in. in depth and underdrained, an arrangement being provided for delivering the raw or untreated water above the level of the surface of the sand, and for drawing it off after it has been purified by passing downwards through the filtering medium. Such a filter will efficiently deal with 2,000,000 gallons per [illegible] but it is nevertheless true, that the dirtier a filter is on the surface the greater is the degree of purification which it effects; immediately after being cleaned the chemical and bacterial efficiency is lowest, and if the rate of filtration be regular and continuous, as it [illegible] increase until it becomes altogether inoperative. The explanation is that the action of filtration is almost entirely biological, and the results obtained are not effected by the sand, but by the thin, slimy, gelatinous film or coating composed of finely divided clay or mud (in which is entangled a mass of algæ and bacteria and diatoms), which forms on the surface and around the grains of sand, constituting a cultivation [illegible] mechanically retained under conditions which are not favourable to their existence. A germ is so infinitesimally small that the finest sand could offer no resistance to its passage with the water. The average "life" (or period of working continuously) of each of the sand filters of the Bolton Corporation is only twenty-four days, on account of the large amount of suspended matter which the waters contain; the average working period for similar filters throughout this country is six weeks, and in some instances as long as five months. The best sand filters will remove, on an average, 99 per cent of the bacteria present in the raw water. The cost of filtration by this system depends upon a number of circumstances, such as the extent of the filters and the condition of the water to be dealt with, but in the case of those belonging to the Bolton Corporation it is, including for repaying capital charges in sixty years, and for repairs and maintenance, 0·74d. per 1,000 gallons.

About twenty years ago pressure or mechanical filters were introduced into this country from America, where they were first used in connection with paper mills to remove from water the grosser particles of matter in suspension which, if not removed, would prejudicially affect the texture and appearance of the paper manufactured. They are now, however, extensively in operation for treating municipal supplies. The usual type of pressure filter consists for the most part of a closed steel cylinder about 8 ft. diameter, with top and bottom convex and concave shaped respectively; it is partly filled with sand or quartz, which rests on a perforated plate, underneath which is a collecting chamber. The raw water, on entering at the top, passes down through the sand into the chamber, and thence into the mains. In order to produce artificially the gelatinous film on the surface of the sand, which, as already explained in the case of slow sand filters, is so essential to efficient purification, a small quantity of sulphate of alumina is introduced to the water before it enters the filter, and this, combining with the carbonate of lime already present, or added also, forms a flocculent, inorganic deposit of insoluble alumina hydrate. The filter is cleaned by reversing the flow of water, the sand being at the same time agitated by revolving arms or a turbine propeller and jets of water, and as a rule this operation requires to be done once a day. The rate of filtration ranges from [illegible] to [illegible] gallons per acre daily, or at least fifty times that of a slow sand filter. In point of efficiency the results obtained from pressure filters are practically identical with those from the best sand filters. The initial and working costs are less; no service reservoir is necessary as an adjunct, as in the case of sand filters; they require little space; and being under pressure there is no appreciable loss of head in working them, while they may be placed at any convenient point between the storage reservoir or source of supply and the point of distribution. The cost of filtration by this method in the two installations in Bolton is 0·59d. per 1,000 gallons (which includes for repaying capital charges in thirty years, repairs and maintenance),

*Lecture delivered recently at Bolton.

and the average cost for both systems is 0·6762d. per 1,000 gallons filtered.

DISTRIBUTION.

From the sand filters the water is delivered into covered service tanks, from which light is excluded to prevent the growth of algæ and infusoria, and from thence, and also direct from the pressure filters, it is conveyed by distributing mains to all parts of the town and district of supply, and delivered to the consumers under a practically constant pressure. There is no need to interpose between the tap and the consumer that snare and delusion the domestic patent filter, in the properties of which some persons, innocently perhaps, place implicit confidence. The spongy iron, animal charcoal, porous stone, coke, and various preparations of iron which those filters contain are liable to become breeding grounds for all kinds of bacteria, and receptacles of filth. They are not only quite unnecessary, but mischievous, and it is the duty of a municipal authority to supply water of a quality not merely fit for consumption, but pure and wholesome, without putting consumers to the expense and trouble of household filtration. The Waterworks Clauses Act defines a constant supply as one "constantly laid on at such a pressure as will make the water reach the top storey of the highest houses within the limits" of the special Act, and although the Bolton Corporation is not under obligation to deliver water to any house except by gravitation, not only is the pressure in our mains constant, within certain limits of fluctuation due to irregular draught upon them, but every house in the town has an ample supply provided at a sufficient pressure, which is also adequate for fire-extinguishing purposes. In this respect great improvement has been made within recent years, and many millowners who pay large amounts for fire insurance protection have reason to appreciate the increase of pressure by which considerable saving in premiums for such has thereby been effected.

Owing to the configuration and range of levels in a town or district of supply it is frequently necessary, in order to ensure that the pressure shall not be excessive in the lower parts, nor insufficient in the higher portions, to divide it into sections or zones of level. Thus the difference in level within the limits of the Bolton Corporation's water area (excluding Belmont village, supplied from Daddy Meadows Springs, and Edgworth district, supplied from Crowthorne reservoir) is 500 ft., and the district is divided into two zones, the upper zone being dependent upon the Spring reservoir, and the lower zone upon the Entwistle and Dingle reservoirs. In the higher reaches of a town the inequalities of pressure arising from the heavy demands upon the mains during certain parts of the day are sometimes met by the provision of a high-level tank or tower, which automatically fills up during the night when the pressure is greatest, and pays out during the day when the demand is greatest. An example of this is seen in the tank at Top o' th' Cow, Bolton, and the famous Norton Tower, Liverpool.

The water supplied for strictly domestic purposes is charged for by a rate or rent levied upon the nett annual value or upon the gross annual value, upon the poor rate assessment, upon the rack rent, or upon the full rent. What is to be included within the description "domestic purposes" and what by "trade purposes" is sometimes difficult to determine, as witness the recent cases of the *Metropolitan Water Board* v. *Avery* and *Others* v. *Metropolitan Water Board*. In the latter action, which came before the High Court on October 14th and 16th last, Mr. Justice Sargeant held that the true test is not the character of the user, but the character of the premises; and that it matters not whether the whole of the water consumed is for purposes "domestic" within the Avery decision, if any part of the premises is used for the purpose of any trade or business. The Waterworks Clauses Act, 1863 (sec. 12), provides that domestic supply "shall not include a supply of water for cattle, or for horses, or for washing carriages, where such horses or carriages are kept for sale or hire, or by a common carrier, or a supply for trade, manufacture or business, or for watering gardens, or for fountains, or for any ornamental purpose"; but a definition of what is held to be included in a "domestic supply" is to be found in the Special Act of every waterworks authority, and by any user of water that is not strictly "domestic" as defined by such Act, the authority may make any demand they choose.

While water authorities are under legal obligation to supply water for domestic purposes, they are not bound to supply water for other purposes, such as for trade and for manufacturing, and such supplies are given under an agreement, a charge being made for each 1,000 gallons so given and measured by meter.

It is frequently urged that water supplies should be given not only for trade, but for domestic and all purposes, by measurement, so as to avoid inequality of treatment and as a check upon waste and misuse. It must be admitted there is a great amount of water wasted in every town due to badly designed appliances, defective workmanship, the employment of inferior material, resulting in leaking pipes, which, being out of sight, are out of mind, and by carelessness, as shown by leaving taps open, a mere dribble from which continued for a year represents in money value the water rent of an artisan cottage; but there are numerous objections to this proposal, the chief of which is that it would tend to restrict the legitimate and necessary use of water and discourage habits of cleanliness, and any arrangement which would discourage the application of water to useful purposes is an obstacle to social progress, and must therefore not be tolerated. A further serious objection to the introduction of the house meter system is the amount of capital involved, which, in a town like Bolton, would not be less than £100,000, and in addition there would also be the cost of inspection and repairs of such meters, or a total expenditure which would not fall short of an average annual water rate.

In these remarks I have tried, from an engineering point of view, to accomplish the task given me by showing what is involved in the provision of a municipal water service. Perhaps they will help us to realise more clearly than hitherto to what extent we are dependent upon the domestic tap. We turn it and the water flows; it is such a common operation that we expect it as a matter of course. And yet what engineering difficulties have had to be surmounted, what miles of culverts and pipes laid, or moorland and fell searched, of the huge reservoirs designed to receive the precious liquid, in order that we may so easily obtain an abundant supply of water in our houses. It is all so simple to the superficial observer, yet withal wonderful and grand.

SOME RECENT PUBLICATIONS.*

HAZELL'S ANNUAL, 1915. Price 3s. 6d. nett. London: Hazell, Watson & Viney.

The 1915 edition of "Hazell's Annual" (now in its thirtieth year of issue) makes another remarkable stride forward as the most comprehensive of existing works of reference. To summarise the additional features which have been added to the present issue would in itself make a serious demand upon our space. Some idea, however, of the extraordinary extent and variety of the information compressed into this wonderful book may be conveyed when we state that its index (easily the most efficient index in any annual work of reference) now contains close upon 20,000 entries. In spite of the demand made on its space by the war "Hazell's" remains true to its reputation as a faithful recorder of all the "movements of the time." Features we may note as considerably enlarged are the lists of the personnel of Government departments and of public bodies; the pages devoted to banking, railways, shipping and insurance; the newspapers of the United Kingdom and Colonies; and the sections on engineering and science. Finally, we must give a word of praise to the excellent tables on the Income Tax, which will enable income tax payers to see at a glance what their obligations will be during 1914-15 and 1915-16. It is not too much to say that "Hazell's Annual" has, with its thirtieth issue, entered on an entirely new career of usefulness as an indispensable work of reference.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—The rapid increase of sand wastes around our coasts is indeed a serious one, and Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books

Institution of Water Engineers.

WINTER GENERAL MEETING IN LONDON.—(2.)

[illegible]

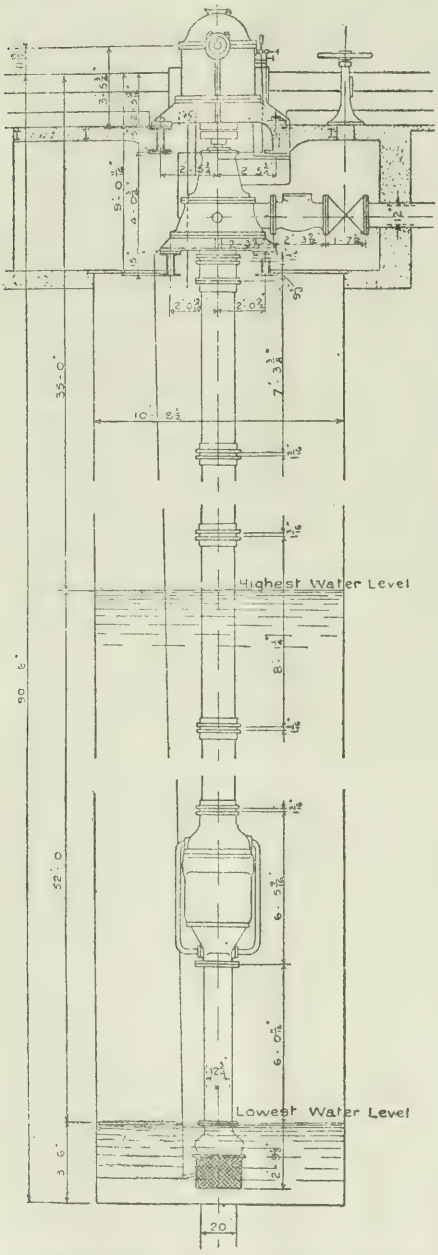
THE WHITTON PUMPING STATION, IPSWICH CORPORATION WATERWORKS.

By CHARLES W. S. OLDHAM,
Borough Water Engineer.

[illegible]

The supply was originally obtained from wells sunk in the chalk at Bramford, giving at the time a supply of 500,000 gallons per day. Between the sanctioning of the undertaking and the completion of the works the population increased from 30,000 to 50,000, and the consumption rose to 1,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 70,000, and the consumption to 2,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 90,000, and the consumption to 3,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 110,000, and the consumption to 4,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 130,000, and the consumption to 5,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 150,000, and the consumption to 6,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 170,000, and the consumption to 7,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 190,000, and the consumption to 8,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 210,000, and the consumption to 9,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 230,000, and the consumption to 10,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 250,000, and the consumption to 11,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 270,000, and the consumption to 12,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 290,000, and the consumption to 13,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 310,000, and the consumption to 14,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 330,000, and the consumption to 15,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 350,000, and the consumption to 16,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 370,000, and the consumption to 17,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 390,000, and the consumption to 18,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 410,000, and the consumption to 19,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 430,000, and the consumption to 20,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 450,000, and the consumption to 21,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 470,000, and the consumption to 22,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 490,000, and the consumption to 23,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 510,000, and the consumption to 24,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 530,000, and the consumption to 25,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 550,000, and the consumption to 26,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 570,000, and the consumption to 27,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 590,000, and the consumption to 28,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 610,000, and the consumption to 29,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 630,000, and the consumption to 30,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 650,000, and the consumption to 31,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 670,000, and the consumption to 32,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 690,000, and the consumption to 33,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 710,000, and the consumption to 34,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 730,000, and the consumption to 35,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 750,000, and the consumption to 36,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 770,000, and the consumption to 37,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 790,000, and the consumption to 38,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 810,000, and the consumption to 39,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 830,000, and the consumption to 40,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 850,000, and the consumption to 41,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 870,000, and the consumption to 42,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 890,000, and the consumption to 43,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 910,000, and the consumption to 44,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 930,000, and the consumption to 45,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 950,000, and the consumption to 46,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 970,000, and the consumption to 47,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 990,000, and the consumption to 48,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,010,000, and the consumption to 49,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,030,000, and the consumption to 50,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,050,000, and the consumption to 51,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,070,000, and the consumption to 52,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,090,000, and the consumption to 53,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,110,000, and the consumption to 54,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,130,000, and the consumption to 55,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,150,000, and the consumption to 56,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,170,000, and the consumption to 57,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,190,000, and the consumption to 58,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,210,000, and the consumption to 59,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,230,000, and the consumption to 60,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,250,000, and the consumption to 61,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,270,000, and the consumption to 62,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,290,000, and the consumption to 63,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,310,000, and the consumption to 64,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,330,000, and the consumption to 65,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,350,000, and the consumption to 66,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,370,000, and the consumption to 67,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,390,000, and the consumption to 68,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,410,000, and the consumption to 69,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,430,000, and the consumption to 70,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,450,000, and the consumption to 71,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,470,000, and the consumption to 72,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,490,000, and the consumption to 73,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,510,000, and the consumption to 74,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,530,000, and the consumption to 75,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,550,000, and the consumption to 76,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,570,000, and the consumption to 77,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,590,000, and the consumption to 78,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,610,000, and the consumption to 79,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,630,000, and the consumption to 80,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,650,000, and the consumption to 81,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,670,000, and the consumption to 82,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,690,000, and the consumption to 83,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,710,000, and the consumption to 84,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,730,000, and the consumption to 85,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,750,000, and the consumption to 86,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,770,000, and the consumption to 87,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,790,000, and the consumption to 88,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,810,000, and the consumption to 89,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,830,000, and the consumption to 90,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,850,000, and the consumption to 91,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,870,000, and the consumption to 92,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,890,000, and the consumption to 93,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,910,000, and the consumption to 94,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,930,000, and the consumption to 95,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,950,000, and the consumption to 96,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,970,000, and the consumption to 97,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 1,990,000, and the consumption to 98,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,010,000, and the consumption to 99,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,030,000, and the consumption to 100,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,050,000, and the consumption to 101,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,070,000, and the consumption to 102,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,090,000, and the consumption to 103,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,110,000, and the consumption to 104,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,130,000, and the consumption to 105,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,150,000, and the consumption to 106,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,170,000, and the consumption to 107,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,190,000, and the consumption to 108,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,210,000, and the consumption to 109,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,230,000, and the consumption to 110,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,250,000, and the consumption to 111,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,270,000, and the consumption to 112,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,290,000, and the consumption to 113,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,310,000, and the consumption to 114,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,330,000, and the consumption to 115,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,350,000, and the consumption to 116,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,370,000, and the consumption to 117,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,390,000, and the consumption to 118,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,410,000, and the consumption to 119,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,430,000, and the consumption to 120,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,450,000, and the consumption to 121,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,470,000, and the consumption to 122,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,490,000, and the consumption to 123,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,510,000, and the consumption to 124,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,530,000, and the consumption to 125,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,550,000, and the consumption to 126,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,570,000, and the consumption to 127,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,590,000, and the consumption to 128,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,610,000, and the consumption to 129,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,630,000, and the consumption to 130,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,650,000, and the consumption to 131,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,670,000, and the consumption to 132,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,690,000, and the consumption to 133,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,710,000, and the consumption to 134,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,730,000, and the consumption to 135,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,750,000, and the consumption to 136,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,770,000, and the consumption to 137,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,790,000, and the consumption to 138,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,810,000, and the consumption to 139,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,830,000, and the consumption to 140,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,850,000, and the consumption to 141,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,870,000, and the consumption to 142,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,890,000, and the consumption to 143,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,910,000, and the consumption to 144,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,930,000, and the consumption to 145,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,950,000, and the consumption to 146,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,970,000, and the consumption to 147,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 2,990,000, and the consumption to 148,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 3,010,000, and the consumption to 149,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 3,030,000, and the consumption to 150,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 3,050,000, and the consumption to 151,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 3,070,000, and the consumption to 152,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 3,090,000, and the consumption to 153,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 3,110,000, and the consumption to 154,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 3,130,000, and the consumption to 155,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 3,150,000, and the consumption to 156,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 3,170,000, and the consumption to 157,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 3,190,000, and the consumption to 158,000,000 gallons per day. The supply was augmented by the sinking of wells at Bramford, Sproughton, and Rushmere, and by the construction of a reservoir at Rushmere, with a capacity of 1,000,000 gallons. The population increased to 3,210,000, and the consumption to 159,000,000 gallons per day. The supply was augmented

upper part of the shaft from rusting due to being alternately wet and dry. A non-return valve is fixed on the pumping main to prevent shock to the rising main and foot valve when stopping the plant. The lubrication of the gears and top thrust-bearing is an important feature of the design. The oil is contained in an oil well at the bottom of the casing,



Whitton Pumping Station: Section of Well showing Pump.

and is pumped by a screw device upwards through the thrust-bearing, and on to the gear wheels, whence it flows back to the oil well, where it is cooled by water coils before being again pumped up.

The main pump is a high-lift vertical centrifugal three-stage pump, capable of delivering 1,850 gallons per minute against a head of 164 ft., and 1,400 gallons per minute against a head of 216 ft., in both cases at a speed of 350 revolutions per minute of the engine shaft. The fuel consumption guaranteed was 784 lb., with a margin of 5 per cent—that is a maximum of 823 lb. of fuel for each 1,000,000 gallons pumped. Careful running trials showed that, owing to the water in the well not falling as low as anticipated by some 10 ft., the most economical speed at which to run the plant was about 330 revolutions per minute, and at this speed the results proved that 1,000,000 gallons could be pumped against an average head of 203 ft. with a fuel consumption of 655 lb. Further tests proved the pump capable of supplying water at considerably greater heads without speeding up the engine, the results being 1,250 gallons per minute against 226-ft. head, and 1,080 gallons per minute against 236-ft. head. It should be noted that on starting the plant the sluice valve on the delivery main is closed for a few minutes, the head on the pump being then 229 ft.

The plant is run by one man, who is not a fitter, and who has had no previous experience of Diesel engines, the only other employee at the pumping station being a youth engaged as cleaner and for general work in the grounds, &c.

Owing to the fact that the plant was of such a novel type, the corporation required very stringent guarantees from the makers. The engine and pump were guaranteed for two years, and the vertical shaft and gears for four years, this guarantee including a definite undertaking by the contractors to replace the gears should they prove unsatisfactory or defective in any way during the period of guarantee, with some other form of gear, and should experience show the form of gear then installed to be unsatisfactory, the same guarantee was to apply to any alternative gear.

Each week a skilled fitter is sent from another pumping station to overhaul and clean the valves, &c. This man also had had no previous experience with Diesel engines.

The water pumped is measured by means of a 12-in. Leeds Helix meter, with graphic recording apparatus, placed on the pumping main, and very careful periodical measurements of the water pumped compared with check measurements at a reservoir prove this meter to be very accurate and reliable. A water-level indicator with low-water alarm is fitted in the well, and has proved very satisfactory; it is of simple construction, has no floats or pulleys, but consists of a hollow tube suspended in the water with the bottom end sealed, and the depth of submergence of this tube is indicated on a dial through rack and pinion gear.

From the time the plant was put to work in February last up to the middle of October 150,000,000 gallons had been pumped, and the average quantity of fuel used to pump 1,000,000 gallons against a head of 203 ft. has been 645 lb. The average cost of crude oil being £3 13s. per ton delivered into storage tanks at the pumping station, the fuel cost per 1,000 gallons lifted 100 ft. works out at ·125d., or ⅛d. Including paraffin, which is used for a short period at each run, the total fuel cost averages ·136d. per 1,000 gallons lifted 100 ft.

The oil is stored in two second-hand Lancashire boilers, with the flues removed. The engine-house and driver's cottage are lighted by means of a "Willett" petrol air-gas plant.

The following are the costs of the various works carried out:—

Hire and purchase of land	£900
24-in. bore 301-ft. deep, lined 54 ft., together with 14 days' test pumping	649
10-ft. diameter well 90 ft. 6 in. deep cast-iron lined, 100 ft. heading 6 ft. by 4 ft. and test pumping	2,429
3,791 yds. of 18-in. cast-iron pumping main, pipes, and laying, complete with valves, way leave, &c.	5,749
12-in. Helix meter	150
Engine house and foundations, allowing for second set. Roads, fencing, &c.	2,361
Cottage	250
Engine, pump and 10-ton crane	2,530
Oil-cart, boiler for storage, &c.	155
Lighting plant, level indicator, telephone, &c.	110
Making good highways	272
Forming banks, clerk of works, &c. ...	340
Total ...	£15,895

Note.—The cost of the Act of Parliament, which included powers other than for the Water Department, was £1,620, repayable in five years.

The plant has, up to the present, worked exceedingly well, and no trouble has been experienced. The

The Surveyor

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Law Notes.

EDITED BY J. B. REIGNIER CONDER, 57 Moorgate-street, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the offices of THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction i.e., without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

STREET WIDENING: PART OF A HOUSE.—In *Beyfus and Others* v. *Westminster City Council* (Chancery Division, Mr. Justice Sargant, October 19th) the plaintiffs were the owners of a restaurant in Old Compton-street, which was let on lease for seven, fourteen, or twenty one years. The council, acting under the powers conferred by Michael Angelo Taylor's Act, 1817, served on the plaintiffs, and also on the lessee of the premises, a notice to treat in respect of the front portion of the property to the depth of about 4 ft., in order to carry out a scheme for the widening of the street. The plaintiffs objected to the council taking a portion of the premises, because they considered that this would destroy their identity and necessitate structural alterations to the rest of the building. The lessee, on the other hand, was unwilling that the council should take the whole of the premises, but he did not object to refacing if the part was taken. Mr. Justice Sargant granted an injunction restraining the council from proceeding under the notice to treat.

QUERIES AND REPLIES.

In order to avoid confusion queriste are requested to use distinctive words as noms de plume. *The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.*

ALTERATION OF AREA: COMPENSATION TO OFFICER: REDUCTION OF SALARY: PAYMENT OF COMPENSATION DEFERRED.—"Perplexed" writes: I enclose a copy of the submission and award (*Myself* v. *The Corporation of X*) for your consideration. As this is a matter of vital importance to surveyors and others whose districts may be annexed, I think it will interest you. Your opinion as to what the award really means would be appreciated.

From the documents accompanying the query it appears that a Provisional Order was made, and confirmed by an Act of 1911, whereby among other districts the A urban district was added to the borough of X, and the urban district council ceased to exist as from the appointed day. The Provisional Order applied sec. 118 (3) and sec. 120 of the Local Government Act, 1888, to all persons who at the commencement of the order held office as officers of the urban district council, and also provided that every officer who, by virtue of the order or of anything done in pursuance or in consequence thereof, should suffer direct pecuniary loss by abolition of office or by diminution or loss of fees or salary, and for whose compensation no other provision was made by any enactment for the time being in force and applicable to his case, should be entitled to have compensation paid to him by the corporation for that pecuniary loss, and that reduction of salary was a direct pecuniary loss. It was also provided that in determining compensation regard was to be had to the requirements of subsec. (3) of sec. 120 of the Act of 1888, and that the compensation was not to exceed the limit therein mentioned. "Perplexed" was an officer of the urban district council, his term of service having been a few months less than ten years, reckoning to the date of the appointed day. About five months before the appointed day the town clerk of X wrote to him that the corporation would not be able to take over his services on the extension of the city. Correspondence ensued, with the result that on the appointed day the officer entered the service of the corporation, but at a less salary than he had been receiving from the urban district council. Compensation was awarded him of an annual sum equal to the loss of salary, but the corporation deferred payment of such compensation (except as to about one-ninth of the amount) until the officer's employment by them should cease. Disputes arose between the corporation and the officer as to this, and all matters in difference were referred to arbitration. By his award the arbitrator found that the officer was not a transferred officer under the Acts. I presume this means that he did not become an officer of the corporation by virtue of sec. 118 (13) of the Local Government Act, 1888. It would appear therefore that the arbitrator came to the conclusion that the office was abolished by the corporation under sec. 119 (3) of that Act, and that the employment of the officer by the corporation was under a fresh engagement and not under the Act. The arbitrator also found that the corporation were entitled to defer payment of the annual compensation awarded to the officer (except as to the small fraction thereof already mentioned) until the determination of his employment by them. Under sec. 120 (6) of the Act of 1888 the corporation had power to fix the date at which the compensation was to commence, subject to appeal to the Treasury. Presumably the arbitrator was of opinion that the action of the corporation in deferring payment was justified by this section. The case appears to be a hard one for the officer, and contrary to the apparent intention of the Act of 1888, viz., that the compensation should be adequate to the loss.

BRIDGE OVER RAILWAY: ALTERATION.—"D." writes: Within an urban district there is a highway passing over a railway by means of a bridge constructed by the railway company at the time the railway was made. The company pay an annual sum for the maintenance of the road on the bridge. The urban council now wish to construct a footway over the bridge, but to do so will diminish the present height of the parapet wall above the surface of the road by about 6 in., and the width of the carriageway by 4 ft. (1) Can the urban council construct this footway under sec. 147 of the Public Health Act, 1875, without the consent of the railway company? (2) If the footway is constructed, would the council have to raise the parapet wall?

(1) This section gives the council power to agree with the railway company to adopt the bridge as part of the streets or roads repairable by the public, and upon such an agreement being entered into the company's liability to maintain the bridge would cease, and the council could, presumably, construct the footway. (2) Under sec. 50 of the Railway Clauses Consolidation Act, 1845, the fence on each side of the bridge must be of a minimum height of 4 ft., and, I think, if the council adopt the bridge they would be bound to maintain the fences at that height.

CONTRACT WITH DISTRICT COUNCIL: SUBSEQUENT ELECTION OF CONTRACTOR AS COUNCILLOR.—"A. B." writes: A person contracted with a district council for the supply of broken stones for the repair of the highways from his own quarry early last year for twelve months, and his contract was accepted. At a later period he was elected as district councillor for the parish. Can he continue to supply the material, or is he disqualified? The contract includes getting the material, breaking, and carting on to the roadside.

Sec. 46, subsec. (2), of the Local Government Act, 1894, provides that a person shall not be disqualified for being elected or being a member or chairman of a council by reason of being interested in any contract with the council for the supply from land of which he is owner or occupier of stone, gravel or other materials for making or repairing highways or bridges, or in the transport of materials for the repair of roads or bridges in his own immediate neighbourhood. The contractor in question appears to come within this proviso, and can therefore, I think, continue to supply and transport the material without being disqualified. I presume it is usual in contracts of this nature for the quarry owner to get and break the material, and I think these processes can reasonably be considered as incidental to supplying it.

PRIVATE STREET WORKS: INCIDENTAL EXPENSES.—"Frontager" inquires if, under the Public Health Act, 1874, sec. 150, the council are empowered to claim any expenses incurred by them before service of notice on the frontagers in connection with cost of surveys, preparation of plans, estimates, &c. Are they entitled to charge a percentage on the outlay, or should the expenses be treated as the actual expenditure? Would the local authority be entitled to include in the cost of carrying out the work any expenses of the surveyor or clerk in connection with work done by themselves with reference to plans, preliminary notices, and also with respect to preparation of surveys and apportionments?

This is a doubtful point. In *Walthamstow Local Board* v. *Stow* (1891, 2 Ch. 606, 31) Justice Chitty expressed the opinion that incidental expenses such as surveys, plans, superintendence, notices, &c., could be included in the estimate, but the Court of Appeal was doubtful, and left the point undecided. In *Re Hanwell Urban District Council and Sykes* (48 J.P., 486) Mr. Justice Channell held that the council could not charge £5 per cent to cover office and incidental expenses. In proceedings under the Private Street Works Act, 1892, a commission of £5 per cent in respect of surveys, superintendence and notices may be included in the estimate (sec. 9, subsec. (2)).

We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, A.M.I.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bridewell Place, E.C. *Envelopes must be marked* Assistants' Section. *Letters, drawings, or communications are invited to submit questions for consideration, and answers to the questions which appear. For the best communication on a subject to be chosen by the Editor a monthly prize of books will be awarded. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

The prize for December is awarded to

Mr. P. Hamilton,
Hyde House,
Sadler-street,
Wells.

QUESTIONS.

This week answers are invited to the following questions:

445. Cement Testing. Sketch and describe the apparatus necessary for conducting the briquette, weight and specific gravity tests for Portland cement.

446. Materials. What is Mexican asphalt? Is it a natural product? Are Trinidad Lake asphaltic cements merely a trade term for a brand of petroleum? In the former event part of Mexico does not come under the F. W. Z. standard.

447. Geodesy. Explain what is meant by "Geodesy." What is meant by a "base of verification"?

449. Roof Truss. Sketch a light iron roof truss for a span of 20 ft., and give constructional details of the joints.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

448. Hydraulics. Explain and illustrate by reference to a stream of rectangular section, 12 ft. wide and 3 ft. deep, the terms "hydraulic mean depth" and state in what manner and approximately to what extent the mean velocity of the stream would be affected by widening it to 24 ft., keeping the depth and inclination the same. (A.M.I.C.E.)

The "hydraulic mean depth" is defined as

$$\frac{\text{Cross sectional area of stream}}{\text{wetted perimeter}} = \frac{a}{P}$$

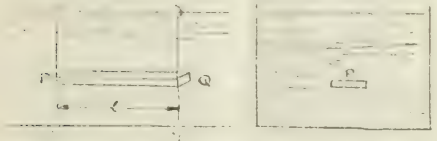
For a rectangular section 12 ft. × 3 ft. area = 3 × 12 = 36 sq. ft.; perimeter = 12 + 3 + 3 = 18 ft.

$$\text{Hydraulic mean depth} = \frac{36}{18} = 2 \text{ ft.}$$

For rectangular section 24 × 3: area = 72 sq. ft., perimeter P = 24 + 3 + 3 = 30.

$$\text{Hydraulic mean depth} = \frac{72}{30} = 2 \cdot 4 \text{ ft.}$$

Consider a small length l of stream, say 10 ft., between sections XX and YY.



Let Z ft. be fall of surface between XX and YY and let i be inclination, i.e. fall per foot length of surface of water, then $i = Z/l$ of inclination is small.

Consider a small filament of liquid PQ, such that velocity is the same at any point in PQ and P and Q are same depth below the surface.

Energy per unit volume at point P = $p + w$ (where p = pressure per unit area and w = weight per unit volume) and pressure at Q = $\left(p + \frac{dp}{ds} l\right)$ since pressure and pressure at P and Q. The pressure at P is the sum of the pressure at P and Q since [illegible] and from these equations [illegible]

If Q and P are [illegible] the latter by $\frac{dp}{ds} l$ the latter by $\frac{dp}{ds} l$ [illegible]

[illegible]

[illegible]

$$\frac{dp}{ds} l$$

hydraulic mean depth, and the type of formula connecting [illegible] for J.

[illegible]

$$J = \sqrt{\quad}$$

[illegible]

$$= \left(\quad\right)$$

[illegible]

$$\sqrt{\quad}$$

[illegible]

$$\frac{1}{1 + \frac{\quad}{\sqrt{\quad}}} \qquad \frac{1 \cdot 1}{1 + \frac{\quad}{\sqrt{\quad}}}$$

Where [illegible] channel.

[illegible] = 2

[illegible] = 5

[illegible] proportional to the square of the velocity. This does not hold in all cases, and logarithmic formulæ are substituted, in which the resistance is assumed to be proportional to some power of v not necessarily 2.

[illegible] where [illegible] determined experimentally for various conditions.

Taking case of [illegible] and using Bazin's Formula in which $c = \cdot 5$.

$$\frac{157 \cdot 5}{1 + \frac{\cdot 5}{\sqrt{\quad}}}$$

Section 12 × 3 =

$$\text{Hydraulic mean depth} = 2 \qquad \frac{157 \cdot 5 \sqrt{2}}{1 + \frac{\cdot 5}{\sqrt{2}}} \sqrt{2} = 161 \sqrt{\quad}$$

Section 24 × 3 =

$$\text{Hydraulic mean depth} = 2 \cdot 4 \qquad \frac{157 \cdot 5 \sqrt{2 \cdot 4}}{1 + \frac{\cdot 5}{\sqrt{2 \cdot 4}}} \sqrt{2} = 181 \sqrt{\quad}$$

Since [illegible] in each case, the [illegible] channel (24 × 3) with the larger value of m, is greater

velocity than that in the channel (12 × 3), the velocities being in the ratio 181 : 364. (W. R. H., *Fulham.*)

The "hydraulic mean depth" is the ratio between the cross section of the water and the length of the wetted perimeter.

In the given stream the H.M.D.

$$(a) \qquad \frac{12 \times 3}{3+12+3} = 2$$

The resistance to the flow varies inversely as the H.M.D.

(*b*) If the stream were 24 ft. wide the H.M.D. would be $\frac{24 \times 3}{3+24+3} = \frac{12}{5} = 2{\cdot}4$

$\therefore$ H.M.D of *a* : H.M.D. of *b* :: 2 : 2·4

:: 1 : 1·2

The velocity varies directly as the resistance to flow, so the velocity will also vary as 1 : 1·2. (S. M. M., *Grimsby.*)

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Hoddesdon U.D.C. (December 14th. Mr. F. H. Tulloch). £900 for the extension of the cemetery.—It was explained that the council considered the purchase necessary in anticipation of future requirements.

Holme Cultram U.D.C. (December 17th. Mr. H. S. Bidwell).—£1,200, supplemental loan, in respect of the Silloth sea wall.—Up to August last year £17,000 had been spent on the work, and of the £1,200 now wanted it transpired that £252 was the amount by which the last loan was overspent. Part of this £252 had been spent in planting trees, making gravel walks and purchasing seats, thus making a pleasure ground on the land side of the wall. One of the councillors contended that this expenditure ought not to have been defrayed out of the loan for the wall. The inspector said this expenditure would appear to be ultra vires, and he asked for full details of it, which the engineer undertook to supply. Information having been given with regard to the shifting of the channel, the inspector said it would appear that what they might originally call a £5,000 wall was going to cost £20,000 before it was finished.

Huddersfield T.C. (December 22nd. Mr. R. C. Maxwell).—This was an inquiry with regard to the sanitary requirements of the town.—The town clerk, Mr. J. H. Field, explained that under a local Act the corporation had power to compel owners, at their own cost, to convert to the water-carriage system. For various reasons they had only made limited use of this power, but they wished to extend it to mills and workshops. The corporation also applied for a Provisional Order authorising them to contribute in their discretion the whole or part of the cost of conversion, and they also asked for borrowing powers. The medical officer of health, Dr. S. G. Moore, said Huddersfield was a somewhat peculiar town, for it was really a small county. For example, there were 235 farmsteads in the borough, and obviously in certain districts there were no sewers, and there would not be any until the density of the population necessitated their provision. The death-rate was practically that of a health resort. It had fallen from 24 per 1,000 in 1871 to 13 at the present day. In the course of the proceedings it was stated that the total cost of the conversion would be £140,988, but the saving in scavenging would be £7,818 a year.

Llandudno U.D.C. (December 29th. Mr. Edgar Dudley).—£1,225 for laying out a golf course of nine holes on the estate on the Deganwy side of the town, which was recently purchased at a cost of £13,000. —The clerk, Mr. Alfred Conolly, stated that the council had entered into a contract with the firm of Messrs. Franks, Harris & Co., Limited, of Guildford, to lay out the links. Mr. C. D. Harris, of this firm, would appoint a foreman to direct the work, and the council would supply the necessary labour. The formation of the greens and bunkers would cost about £750, and drainage, in one place, and the other work would bring the cost of the first nine holes up to £1,225.

Lurgan U.D.C. (December 28th. Mr. P. C. Cowan).—£270 for the carrying out of a scheme for the diversion of flood water in the Queen-street (Ballyblough) district, and a supplemental loan of £1,200 for completing the erection of fifty-four artisans' dwellings in Wellington-street.—It was explained that the lands on the south-east side of the town were higher than the town itself, and the drainage had to pass through the town on its way to Lough Neagh. In times of heavy rain the sewer into which the water discharged was unable to receive the volume of water which emptied into it, with the result that the districts in that part of the town were flooded, and it was to do away with this flooding that the loan of £270 was sought. The other loan was for the completion of the council's housing scheme, for which a loan of £10,000 had already been sanctioned, but had proved inadequate.

Middlesbrough T.C. (December 17th. Mr. P. M. Crosthwaite).—£4,603 for the improvement of Acklam-road.—It was stated that the council propose to construct a new highway 60 ft. wide, through the old Linthorpe Brick Company's yard, and that the new road would cut off a very awkward and dangerous corner.

Worcester T.C. (December 16th. Mr. Edgar Dudley).—£3,400 for an improvement at St. Martin's-gate.—It was explained that a considerable proportion of the proposed loan was required for the purchase of property in connection with the scheme. The inspector referred to the width of the street proposed. It did seem rather inadequate, he said, to spend £3,000 on a street 30 ft. wide. He suggested another 3 ft.

APPLICATIONS FOR LOANS.

Brampton R.D.C.—£3,600 for water supply works.

Ilford U.D.C.—£788 for bowling green and tennis courts, and £170 for a public convenience.

Llandudno U.D.C.—£926 for a new feeder electricity cable.

Macclesfield T.C. £8,689 for the extension of the isolation hospital.

Wigton R.D.C. £6,000 for water supply works.

LOANS SANCTIONED.

Barking U.D.C.—£4,300 for the purchase of land for a playing field.

Bury T.C.—£4,500 for road diversion.

Cockermouth R.D.C.—£800 for sewerage works.

Dewsbury T.C.—£20,422 for the erection of eighty-four workmen's houses.

Ipswich T.C.—£1,900 for adapting a motor boat as a motor sludge boat.

Islington B.C.—£4,975 for electricity extensions.

Newbury T.C.—£1,000 for re-roofing the Corn Exchange.

Stamford T.C.—£4,229 for the erection of houses.

Tamworth T.C.—£1,400 for work in the new recreation ground.

Wirral R.D.C.—£5,928 for sewerage works.

FORTHCOMING INQUIRIES.

JANUARY.

	£
5.—**Burton-upon-Trent.** For work of sewerage and the construction of a rising main (Mr. R. G. Hetherington)	31,700
5.—**York.** For the purposes of the electricity undertaking (Mr. H. R. Hooper) ..	19,150
7.—**Repton.** For sewerage and sewage disposal works (Mr. R. G. Hetherington)	1,700
7.—**Stockport.** For electricity purposes (Mr. H. R. Hooper)	17,000
8.—**Chepping Wycombe.** For sewerage and sewage disposal works (Mr. R. G. Hetherington)	49,010
8.—**Ramsgate.** For the provision of bath, boxing, and public conveniences, and fencing (Mr. F. O. Stanford)	6,783
8.—**Salford.** For the purposes of the electricity undertaking (Mr. H. R. Hooper)	22,910

Plymouth Water Undertaking.—The Corporation of Plymouth intend to promote a Bill for the enlargement of the municipal waterworks, including the provision of additional aqueducts, mains and pipes, and the extension of the area of supply.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear in this issue:—Buildings—Llanelly, Spring-head (Yorks), and town planning—East Preston (Sussex). Works—Bridlington, Failsworth, roads and traffic—Bath, Lancaster, Middlesex, Penge, Southwark, Wilton, sewerage and sewage disposal—Hornsey, Northwich, St. Columb, water supply—Bridlington, Treorky. Particulars of other works projected will be found in the "Local Government Board Inquiries" page.

BUILDINGS.

Llanelly T.C. It has been agreed to seek Parliamentary powers to appoint a joint board representative of the Llanelly Town Council, the Llanelly Rural Council, and the Bury Port Urban Council to erect and control an isolation hospital.

Newark T.C. Support battlements are to be erected adjoining the market hall, at a cost of £32.

Springhead (Yorks) U.D.C. Consideration having been given to this district of a scheme for providing the inhabitants of Saddleworth, Springhead, and Lees with a public park, the Local Government Board have intimated that they will be prepared to sanction a loan for the purpose.

Wolverhampton T.C. It is proposed to provide a roof of steel construction to replace the timber roof at the east portion of the municipal offices in Lichfield-road. The work is estimated to cost £200, and it is also proposed to provide a new steel gate, to cost £210.

HOUSING AND TOWN PLANNING.

Billinge U.D.C. The council are asking for sanction to a scheme for the provision of two working-class houses at Garswood.

Caistor R.D.C. Loans are being applied for for the erection of houses at £309, £301, and £225 respectively.

East Preston (Sussex) R.D.C.—The Local Government Board having approved the council's housing scheme, it is proposed to borrow £1,000 for the erection of cottages at Angmering.

Stourbridge T.C. The usual steps have been taken for promoting a scheme for the erection of artisans' dwellings within the borough area.

Watford U.D.C.—By the housing scheme, which has been approved, it is proposed to build 12 cottage houses in Wallow-lane.

PARKS AND OPEN SPACES.

Coventry T.C.—It has been agreed to spend £3,970 upon improvements at Central Green, including the enclosing of the land and the construction of a path 8 ft. wide, connecting Bailey-road and Willenhall-road. A bandstand is being erected, and is to be constructed at a cost of £500. The council have further decided to erect a pavilion in Spencer Park at an estimated cost of £1,100.

Exeter T.C.—An extension scheme is to be carried out at Northernhay Gardens, at an estimated cost of £205, according to plans prepared by the city surveyor, Mr. T. Moulding.

REFUSE COLLECTION AND DISPOSAL.

Bridlington T.C.—The council have confirmed a proposal of a joint committee to erect a refuse destructor on a site adjoining the electricity works off Quay-road.

Failsworth U.D.C.—A sub-committee has been appointed to visit several towns in order to inspect their dust destructors.

ROADS AND MATERIALS.

Amesbury R.D.C. The surveyor, Mr. J. T. Huxham, reported that he had received from the chief engineer of the Southern Command a report as in respect of the repair of about 7¼ miles of the Devizes road in the council's district in the neighbourhood of Rollestone Camp. The cost would be borne by the War Office. Heavy traffic was to be at once turned on to the road, and constant repairs would be necessary to keep the road in a fit state to bear it. The road by Larkhill had never been repaired by the council, and it would be wise to have it made clear that the council would not accept the liability to repair it after the war. He would want a constant supply of stone, and a large staff of labourers must be available. The council agreed to comply with the requisition of the military authorities.

Barking U.D.C. [illegible] has been asked to prepare a plan for widening Upney-[illegible]

Bath R.D.C. The council have sanctioned an [illegible] Mr. [illegible] to remove certain elm trees and plant an avenue of [illegible]

Colne T.C. [illegible]

Crompton U.D.C. [illegible] of Beal-lane with granite setts, at an estimated cost of £1,500.

East Grinstead R.D.C.—The surveyor, Mr. C. Turton, has received a requisition from the military [illegible] lane to Wych Cross at Forest-row, and the council have decided that the surveyor shall present the [illegible] that no extra expense fell upon the council.

Exeter T.C.—The council have approved a report by the city surveyor, Mr. T. Moulding, advising the [illegible] should be carried out departmentally.

Inverness C.C. The council have agreed to take over and maintain the Bays of Harris-road when completed.

Lambeth B.C. The council have adopted the recommendation of the Highways Committee that the [illegible] should be carried out departmentally.

Lancaster T.C.—A scheme has been approved for a 50-ft. road at the north end of the town to connect [illegible]

Maldens and Coombe U.D.C.—The total apportionments of the new roads taken over under the Private Streets Works Act since 1907 amounted to £19,665, or, including six new roads now in progress, at a [illegible]

Middlesex C.C. [illegible] Highways Committee reported recently that special consideration had been given to the question of repaving Seven Sisters-road, which had within the last few days been in such a condition that the police had to divert the traffic. It was to the interest of all concerned that the work should proceed at once. It was stated that the Hornsey Borough Council would [illegible]

Panteg U.D.C.—Upon the Llanfrechfa Upper Council agreeing to bear one-third of the cost, the council have approved a scheme for the construction of a road from Pontymoel to Llantarnam, at an estimated cost of £3,100, contributing a third themselves. The remaining third of the cost has been promised by the Road Board.

Ripon T.C.—An extensive scheme for the construction of roads to a new military camp in the town-[illegible] Regt. and Clothes-[illegible] the purpose.

Rowley Regis U.D.C.—Tenders are being invited for paving works in High-street.

Sheerness U.D.C.—The question of purchasing a stone breaker has been referred to the Works Committee for report.

Springhead (Yorks) U.D.C.—A sub-committee has been appointed to go into the question of improving several dangerous corners, and the county council have intimated that if it was decided to carry out

the work they would recommend it to the Road Board for a grant.

Stirlingshire C.C. Owing to a shortage of labour the road surveyor has been authorised to get certain improvement works in the Kilsyth district carried out by contract.—Schemes of road widening and improvement, and the formation of footpaths have been prepared in order to meet distress in the event of this arising.

Stourbridge T.C.—The corporation have accepted the offer of the county council to contribute £300 towards the cost of a main road improvement at the corner of Coventry-street and High-street.

Wilton R.D.C.—A considerable scheme of road work was reported upon by the surveyor, Mr. R. A. Skelton, recently, and the council agreed to approve it upon the condition that the military authorities would guarantee to repay the cost. The surveyor's statement was that, by request, he had met engineers representing the War Office and the Road Board respecting the damage which had been done to the roads in the district by War Department traffic. There were also present the surveyors of the adjoining districts and the county surveyor. He was informed that the War Department wanted certain roads repaired and improved, and that they would request the council to do the work, and that the War Department would repay the cost. With regard to the district roads, he had that day received from the War Department a requisition for the repair of the Devizes, Bemerton to Berwick, Kingsway, and New Cut, South Newton, and Stoford Bottom roads. The repairs were to be put in hand at once, and in the meantime an estimate was to be made out and sent to the Road Board. He understood that, as soon as the estimate was approved, the council would receive a payment on account. With regard to the carrying out of the work, he would want at least fifty men, and also extra steam rollers.

SEWERAGE AND SEWAGE DISPOSAL.

Devon C.C. It has been agreed to make a contribution of £240 to the St. Thomas Rural District Council towards the cost of repairs to the sewage tanks at Exminster.

Haslemere U.D.C.—It has been decided to carry out an improved scheme of sewage disposal, at an estimated cost of £7,000.

Ipswich T.C. A scheme has been prepared by the Sewerage Committee, and is still under consideration, for raising the sewage at the outfall, for chemically precipitating the suspended solids, and otherwise dealing with it in such a manner as will secure efficient sedimentation. The extraction of the coarser solids by means of screens will be continued, and the committee believe that the suspended matter which is the cause of the trouble in Fen Bight will be so efficiently removed under the new arrangement that the effluent may safely be discharged into the Orwell estuary without the intervention of filter-beds.

Maldens and Coombe U.D.C.—Consideration of the suggestion of Mr. R. H. Jeffes, the surveyor, that an experimental trial of osier-growing on the part of the new sewage disposal area should be made has been deferred.

Northwich R.D.C.—A decision has been reached to proceed with a sewerage scheme at Rudheath.

St. Columb R.D.C.—The Local Government Board have written stating that, after considering the report made by their inspector with reference to the scheme of sewerage for houses in Atlantic-terrace, Trevone, they concurred in the view that a scheme for Atlantic-terrace was an immediate necessity, but they also thought that the whole of the village of Trevone required sewering, and that the question of a comprehensive scheme ought to be considered at the present stage; and, further, that they would not be prepared to approve any scheme providing for an outfall into the sea until float experiments had been made at the proposed point of discharge. They requested the council to reconsider the matter, and inform the board whether they were willing to submit a comprehensive scheme. The council resolved to ask the board whether they were prepared to sanction the original scheme if the float experiments proved satisfactory.

Settle R.D.C. Plans have been referred to the local committees of Settle, Langcliffe, and Giggleswick of a proposed sewerage scheme which is estimated to cost £4,750.

Stirlingshire C.C.—Alternative schemes have been prepared for sewage disposal at Cambuslang, and the matter is still under consideration. The proposed schemes, which have been prepared by Mr. Greig, Stirling, are: (1) A drainage system, with sewage disposal works at Cambusbarron, and the effluent discharged into the burn; (2) a drainage system with the sewage piped to the river Forth, and with settling and sludge tanks there; (3) a drainage system with the sewage piped to the Raploch, if terms can be arranged with the town council for joining the town sewer there.

Uxbridge R.D.C. The surveyor, Mr. J. W. Harrison, has received instructions to prepare a scheme of sewage disposal for Harefield. The estimated cost is £1,000.

WATER, GAS, AND ELECTRICITY.

Evesham R.D.C.—The council have resolved to proceed with the Harvington water supply scheme, the estimated cost of which is £2,500.

Nantwich R.D.C.—Considerable extensions to the water mains have been decided upon, and the work will be carried out in four sections.

Tetbury U.D.C.—A proposal is under consideration for an improved water supply scheme, estimated to cost £3,150.

Ystradgynlais R.D.C. It is proposed to make extensions of the water supply, at an estimated cost of £1,500.

MISCELLANEOUS.

Falmouth T.C.—The plans of the borough surveyor, Mr. J. S. Walton, have been approved for the extension of the cemetery on a site offered by Lord Kimberley.

Poole T.C. The council have adopted the scheme of the medical officer of health for establishing and equipping a municipal laboratory, at an estimated initial cost of from £20 to £30 and an estimated annual cost of £53. The laboratory, it was stated, would make it possible to carry out locally bacteriological examinations which at the present time were made in London at a cost of about £100 per annum, and would, moreover, have the advantage that the results of these examinations would be procurable much earlier than at present.

PERSONAL.

Mr. A. B. McDonald, M.Inst.C.E., city engineer of Glasgow, has been voted a retiring allowance of £500 a year.

Mr. John C. Miller, assistant borough surveyor of Helensburgh, has been appointed borough surveyor of Inverkeithing.

Mr. F. G. Coates, junior assistant in the surveyor's department, Clacton-on-Sea, has been appointed second assistant to the borough surveyor of Guildford.

Mr. J. W. Hill, assistant in the borough surveyor's department, Stoke-on-Trent, has been appointed assistant in the Birmingham rivers and sewage department.

Mr. A. Burton, engineer and surveyor to the county borough of Stoke-on-Trent, has been transferred from the class of associate-member to that of member of the Institution of Civil Engineers.

Mr. Thomas Moulding, city surveyor of Exeter, was on Tuesday last at the town council meeting congratulated by the Mayor (Mr. J. G. Owen) upon his election as a fellow of the Royal Sanitary Institute.

Proposed By-pass Road in Surrey.—The borough surveyor of Kingston-on-Thames, Mr. R. H. Clucas, has prepared an alternative scheme to the Road Board's proposal for a by-pass arterial road from Kingston Vale to Esher, and the proposal has received the approval of a conference of road surveyors of Greater London, and the concurrence of the Highway Committee of Kingston, who have directed a copy of the surveyor's plan to be sent with a covering letter to the Local Government Board. The proposal of Mr. Clucas is that there shall be a new road commencing at the junction of London-road and Cambridge-road North-ton, and passing along the track of the Metropolitan Water Board's mains to the junction of Surbiton-road and Beaufort-road, near the Surbiton Assembly-rooms.

SOMERSET ROADS AND BRIDGES.

COUNTY SURVEYOR'S REPORT.

Mr. Edmund Sharpe, Assoc.M.Inst.C.E., has issued his first annual report as county surveyor of Somerset, a position relinquished last year by Mr. H. P. Cooper, who is now assistant county surveyor of Kent.

The mileage of main roads in the county, to which the report refers, works up at 871·90 miles, and there are 81·69 miles of urban highways. The estimated expenditure for 1914-15 is £102,673, or £107 6s. per mile, as compared with £92,658, or £97 2s. per mile, in the year under review. In the year 1913-14 the estimated expenditure on rural roads was £76,311, and that on urban roads £6,155, or £87 8s. and £129 per mile respectively. This year the figures are: Rural roads, £89,209 12s. 4d. per mile, and £6,751 £259 3d. per mile. These sums however do not exhaust the amounts allowed for establishment charges or those granted for bridges, improvements and main roads.

It has to be noted that in 1914-15 the county has taken over 9·96 miles of urban roads, and the figures for rural roads being £87 2s. 6d. per mile, and that for urban roads £14,467 - £177 3s. per mile.

The report mentions that 90·96 miles of rural roads are maintained directly by the rural district councils' own workmen in eleven (one partially) districts, and that 38·96 miles are [illegible] in seven (one partially) districts.

The estimated expenditure for 1914-15 included in the rural estimates for 1914-15 are as follow: Crumble £1,092, [illegible] £1,076, [illegible] £1,076, [illegible] £1,076

NANTWICH RURAL DISTRICT COUNCIL.

AUDLEM AND DISTRICT: WORKS OF WATER SUPPLY.

CAST-IRON PIPES, HYDRANTS, SLUICE-VALVES, CASTINGS, &c.; EXCAVATING FOR AND LAYING AND JOINTING WATER PIPES, &c.

The above Council is desirous of receiving Tenders (Contract No. 1) for about 2,100 tons of Cast-iron Water Pipes, Branches and other pieces; (Contract No. 2) for Hydrants, Sluice Valves, Fittings, &c.; and (Contract No. 3) for Excavating for and Laying, Fixing and Jointing about 50 miles of Cast-iron Water Mains, with all the necessary Sluice Valves, Hydrants, Fittings, &c., in connection with the above-mentioned works of water supply in the Rural District. Separate Tenders will be required for each Contract, and for the four sections (each approximately 12½ miles) in Contract No. 3, but one Contractor may tender for the whole.

The Council does not bind itself to accept the lowest or any Tender, and reserves the right to sub-divide the Contracts in such manner as may be deemed expedient.

Drawings and Specifications may be seen at the Offices of Mr. C. E. Davenport, ASSOC.M.INST.C.E., 152 Hospital-street, Nantwich, from whom copies of Specifications, Quantities and Forms of Tender may be obtained on the deposit of Two Guineas, which sum will be refunded on receipt of a *bonâ-fide* Tender and the return to the Engineer of all documents received from him.

Sealed Tenders to be sent in to me not later than Four o'clock in the afternoon of Thursday, the 28th January next, endorsed "Tender, Audlem, &c., Waterworks."

(By order)
H. G. ATKINSON,
Clerk to the Council.

Rural District Council Offices,
Nantwich.
December 30, 1914. (2,211)

NANTWICH RURAL DISTRICT COUNCIL.

CAST-IRON PIPES, HYDRANTS, SLUICE-VALVES, CASTINGS, &c.; EXCAVATING FOR AND LAYING AND JOINTING WATER PIPES, &c.

The above Council is desirous of receiving Tenders (Contract No. 1) for Cast-iron Water Pipes, Branches and other pieces; (Contract No. 2) for Hydrants, Sluice Valves, Fittings, &c.; and (Contract No. 3) for Excavating and Laying, Fixing and Jointing Cast-iron Water Mains, with all the necessary Sluice Valves, Hydrants, Fittings, &c., for purposes of water supply in the Township of Ridley, in the above-named Rural District. Separate Tenders will be required for each Contract, but one Contractor may tender for the whole. The Council does not bind itself to accept the lowest or any Tender.

Drawings and Specifications may be seen at the Offices of Mr. C. E. Davenport, ASSOC.M.INST.C.E., 152 Hospital-street, Nantwich, from whom copies of specifications, Quantities and Forms of Tender may be obtained on the deposit of ten shillings, which sum will be refunded on receipt of a *bonâ-fide* Tender, and the return to the Engineer of all documents received from him.

Sealed Tenders to be sent in to me not later than four o'clock in the afternoon of Friday, the 15th January next, endorsed "Tender, Ridley Waterworks."

(By order)
H. G. ATKINSON,
Clerk to the Council.

Rural District Council Offices,
Nantwich.
December 30, 1914. (2,210)

HIRE OF TRACTION ENGINES.

The above Council wish to Hire, immediately, Traction Engines to haul a large quantity of broken limestone from Railway Stations in this District to Store Depots.

R. A. SKELTON,
District Surveyor.

Bemerton, Salisbury.
December 22, 1914. (2,213)

DIARIES AND CALENDARS.

A notable feature of Charles Letts' pocket books and diaries is the accident insurance coupon, first introduced in 1895. The popularity of this feature is extraordinary, nearly 200,000 registrations being effected annually, among those insuring being several members of the Royal Family and many men of note in all professions and trades. The insurance privileges are much enhanced for 1915; they provide a weekly payment in the event of certain forms of sickness, and, in addition, injury or death due to bombs dropped by hostile air-craft are covered, an up-to-date feature which will doubtless be appreciated.

Among the new diaries for 1915 there is one in particular which at this time is sure to meet with a very large demand—we refer to "The Soldiers' Own Diary"—published at 1s., a most excellent publication for soldiers on active service. The information is useful, and contains an abridged list of English-French words and phrases, and the book is thin and compact, so that it may readily be carried in the pocket.

Another notable diary is "The Investors' Diary and Notebook," one of the cheapest 1s. diaries we have seen; it is well got up, and contains much useful information to investors.

The general compilation of Charles Letts' diaries is under the immediate supervision of Mr. Letts, than whom it is safe to say no one has had greater experience. To each and every detail of manufacture the greatest care is given. The papers are really good, and each diary is admirably adapted for the purpose for which it is intended.

Over 15,000 of these diaries for 1915 have, we understand, been ordered by His Majesty's Stationery Office for the use of various Government departments. Sir Ernest Shackleton also entrusted Messrs. Charles Letts with his order for diaries and journals for the Trans-Antarctic Expedition of 1914-15, and in further proof of their worth Messrs. Charles Letts & Co. have just been awarded the Gold Medal and Grand Prix both at the Milan and Genoa Exhibitions.

The London and Lancashire Fire Insurance Company, Limited, issue, as usual, a very handy case, with back-loop, pencil and pockets, containing a day-to-the-page diary for January, 1915. For this may readily be substituted a refill for each succeeding month as it comes round. The company also issue a tastefully painted tear-off calendar for the coming year.

LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

President—Mr. J. W. CROXFORD.
Vice-president—Mr. R. H. Jeffes.

A meeting of the association will take place at Wimbledon to-morrow (Saturday), the 2nd inst., at 3 p.m.

AGENDA.

(1) Visit the S.C.S. works, sewage works, Durnsford-road, Wimbledon, and see—(*a*) The products obtained by subjecting sewage sludge to destructive distillation, and (*b*) the treatment of sewage by certain products obtained.
(2) Visit cemetery extension.
(3) Open-air bath, Wandle Park.
(4) Tea and hot-pot, Wandle Park House, at 5 p.m.
(5) Meeting of the association and friends at Wandle Park House at 6 p.m.
  (*a*) Minutes of meeting held on December 5th to be read and confirmed.
  (*b*) To consider matters arising thereout (if any).
  (*c*) Correspondence.
  (*d*) Papers by Mr. C. H. Cooper, entitled (1) "Method of Storing Water for Open-air Bath in the Gravel Beds"; (2) "Road Direction Signs."
  (*e*) Questions by members (if any).
  (*f*) General business.

J. G. CAREY,
Hon. Sec. and Treasurer.

CONCRETE INSTITUTE.

[illegible]

H. KEMPTON DYER,
Secretary.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach The Surveyor copy by noon on WEDNESDAYS to ensure their inclusion in the weekly list of appointments. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

[illegible]

ASSISTANT SANITARY INSPECTOR. [illegible] Mr. H. H. Baker, [illegible]

SANITARY INSPECTOR. [illegible] £120 × £5 to £160 per annum. [illegible]

SURVEYOR. [illegible] £160 per annum.—Mr. J. S. Mitchell, clerk.

CITY SURVEYOR. [illegible] £150 × £10 to £200 per annum.—Mr. M. Kirkby, [illegible] Hall.

ROAD FOREMAN. [illegible] Merton Urban District Council, £2 per week.—Mr. [illegible] Merton, Surrey.

CHIEF SANITARY OFFICER. [illegible] Purulia, B.N.Ry., Bihar and Orissa, India.

CLERK OF WORKS. [illegible] Rural District Council, £3 per week.—Mr. [illegible]

CITY ENGINEER AND SURVEYOR.—January 31st, 1915.—Port-of-Spain Corporation. £725, inclusive of travelling allowance.—Mr. Joseph Vidal Lamy, town clerk, Town Hall, Port-of-Spain, Trinidad, B.W.I.

ASSISTANT ENGINEERS.—Appointments in the Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

ASSISTANT ENGINEERS. Public Works Department, Government of the Gold Coast. £350–£400 with furnished quarters.—Crown Agents for the Colonies, Whitehall Gardens, London, S.W.

BOROUGH ENGINEER AND SURVEYOR, AND WATER ENGINEER.—January 7th.—Corporation of Rotherham. £500–£700 a year.—The Town Clerk.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach The Surveyor copy by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

DONCASTER.—January 23rd.—Designs for laying out a site of 20 acres for the erection of 102 workmen's houses, for the corporation.—Mr. R. A. H. Tovey, town clerk.

LIVERPOOL.—February 8th.—Designs for working-class dwellings, for the corporation. Premiums, £100, £50, and £25.—Mr. E. R. Pickmere, town clerk.

WALTHAMSTOW.—Plans for the erection of workmen's dwellings at an estimated cost of £16,000, for the urban district council.—Mr. C. S. Watson, clerk, Town Hall.

BRADFORD.—Designs for the re-planning of streets in the central area of the city, for the corporation.—Mr. Reginald Blomfield, R.A., has been nominated assessor.—Mr. F. Stevens, town clerk.

MUNICIPAL CONTRACTS OPEN.

[illegible]

formation by letter.

Buildings.

ALDRIDGE. [illegible]

CHEPPING WYCOMBE. [illegible] and surface-water drain, for the corporation.—Mr. [illegible]

EDINBURGH. January 5th.—For the erection of a [illegible] Mr. J. A. Williamson, architect, Public Works Offices, [illegible]

GILLINGHAM. [illegible] Mr. J. L. Redfern, borough surveyor.

GLAMORGAN. [illegible] four schools and other works, for the county council. County Hall, Cardiff.

BINGHAM.—January 6th. For the erection of six workmen's houses, for the rural district council. Mr. C. W. Kendrick, sanitary surveyor, Bingham.

WANDSWORTH. January 9th.—For an addition to a public library, for the borough council.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

[illegible] public conveniences, for the corporation.—Mr. B. McG. Gray, surveyor.

[illegible] tages, for the corporation.—Mr. T. Hunter, borough [illegible]

BRISTOL. [illegible] Committee.—Mr. W. W. Squire, engineer, Cumberland-road, Bristol.

SHREWSBURY.—January 12th.—For extensions to [illegible]

COVENTRY.—January 13th.—For the enlargement [illegible] G. & I. Steane, 22 Little Park-street, Coventry.

EASTBOURNE.—January 15th.—For additions to the dispensary, for the corporation.—Mr. W. C. Field, borough architect and building surveyor, Town Hall.

NEWPORT (Mon.).—January 15th.—For the enlargement of a school, for the corporation.—Mr. C. F. Ward, borough architect.

ASHTON-UNDER-LYNE.—January 16th.—For the erection of a school, for the Education Committee.—Messrs. Eaton, Son & Cantrell, architects, Stamford-[illegible]

PORTSMOUTH.—January 18th.—For the erection of a school, for the Education Committee.—Mr. A. E. Cogswell, architect, Prudential Buildings, Portsmouth.

COLCHESTER.—January 20th.—For additions to a hospital, for the Borough and Port Health Committee.—Mr. H. Collins, borough engineer and surveyor.

BOMBAY.—March 7th (date extended).—For the erection and equipment of a refuse destructor, for the Municipal Commissioner.—Messrs. Henry S. King & Co., 65 Cornhill, London, E.C.

MERIONETH.—For the erection of a school, for the Education Committee.—Messrs. Deakin & Howard Jones, architects, Plas Ynys, Borth.

Iron and Steel.

PORTHCAWL.—January 4th.—For the construction of about 5½ miles of cast-iron mains, and other minor works, for the urban district council.—The Surveyor.

CONWAY.—January 5th.—For laying water mains and other works, for the rural district council.—Mr. T. L. Oliver, engineer, Stanley Buildings, Conway.

BIRMINGHAM. January 6th. For the erection of the constructional steelwork comprised in boiler-house, engine-house, switch-house, and offices at Nechell's generating station, for the Electric Supply Committee. Messrs. Harrison & Cox, Council Chambers, 109 Colmore-row, Birmingham.

CONWAY.—January 7th.—For the provision and laying of cast-iron 6-in. and 4-in. water mains, with valves, hydrants, air valves, and chambers, for the rural district council.—Mr. T. L. Oliver, engineer, Stanley Buildings, Conway.

FAVERSHAM.—January 7th.—For laying cast-iron pumping main, supply mains, with all necessary fittings, and the construction of a new service reservoir, for the rural district council.—Mr. H. Howard Humphreys, engineer, 28 Victoria-street, Westminster, S.W.

HULL.—January 9th.—For laying mains for the Holderness water supply, for the corporation.—Mr. C. B. Newton, city water and gas engineer.

HULL.—January 9th.—For the supply of cast-iron pipes and specials, for the Hull water and gas department. Mr. C. B. Newton, city water and gas engineer.

NEWMARKET.—January 11th.—For sinking a well and borehole, for the rural district council.—Messrs. Sands & Walker, engineers, Milton Chambers, Nottingham.

LLANTRISANT.—January 20th.—For laying pipes and providing valves in connection with the Llantwit Fardre waterworks, for the rural district council.—Mr. G. S. Morgan, engineer, 23 Gelliwasted-road, Pontypridd.

Roads.

BROMLEY (Kent).—January 4th.—For works to be executed in the part widening of Mottingham-lane, for the rural district council.—Mr. R. Craig, highway surveyor, Farnborough, Kent.

NORMANTON. January 4th. For work of widening and improving, for the urban district council. The Surveyor.

HUDDERSFIELD. January 4th. For the supply of a motor-driven street sweeping machine with collecting van attached, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

HORNSEY.—January 4th.—For paving with wood blocks, for the corporation.—Mr. E. J. Lovegrove, borough engineer, Town Hall, Highgate.

BICESTER.—January 4th.—For the supply of Hartshill stone and chippings, for the rural district council.—Mr. A. Truman, clerk.

KENILWORTH.—January 5th.—For the supply of kerb and setts, for the rural district council.—Mr. S. Douglas, surveyor.

LEITH.—January 5th.—For the supply of granite and whinstone, for the corporation.—Burgh Surveyor.

BEXLEY.—January 5th.—For the supply of highway materials and stoneware socketed pipes.—Mr. W. T. Howse, surveyor.

EASTHAMPSTEAD.—January 5th.—For the supply of granite, slag, limestones, and flints, for the rural district council.—Mr. J. R. Treadwell, surveyor, Council Offices, Bracknell.

BOSTON. [illegible] For the supply of material for highway purposes in the district.—Mr. H. South, clerk to [illegible].

EAST GRINSTEAD. [illegible] For the supply of material for highway purposes in the district.—Mr. C. [illegible], surveyor.

NORTH RIDING. [illegible] For the supply of road materials for the county district.—Mr. W. C. Bennis, surveyor, County Hall, Northallerton.

MIDDLETON. January 6th. For the supply of about 1,400 [illegible] for the urban district.—Mr. William [illegible], surveyor.

HARDINGSTONE.—January 8th.—For the supply of granite and slag, for the rural district council.—Mr. J. R. Phillips, clerk, 2 St. Giles'-square, Northampton.

BOURNE. January 9th. For the supply of granite and slag, for the rural district council.—Mr. T. Lake, district surveyor.

GLOUCESTERSHIRE. January 9th.—For the supply of stone for main roads, for the county council.—Mr. E. S. Sinnott, county surveyor, Shire Hall, Gloucester.

SOMERSET.—January 9th.—For the supply of about 70,000 gallons of refined tar, prepared in accordance with the specification of the Road Board, for the county contract.—Mr. Edward Stead, county surveyor, Wells.

NORFOLK. January 9th. For the supply of flints, gravel, and chalk, for the county council.—Mr. T. H. B. Hedges, county surveyor, The Shirehouse, Norwich.

LINTHWAITE.—January 11th.—For work of paving with granite setts on concrete, kerbing, flagging, asphalting, and other incidental work, for the urban district council.—Mr. Albert Mallinson, surveyor.

TRING.—January 11th.—For the supply of 12,000 gallons of refined coal tar complying with the Road Board's specification, for the urban district council.—Mr. S. S. Gettings, surveyor.

WOODSTOCK.—January 11th.—For the supply of best hand-picked unbroken stone, best broken stone (2-in. gauge), best double-screened nuts, and binding chippings, for the rural district council.—Mr. A. G. Higgs, clerk.

MALDENS AND COOMBE.—January 12th.—For the supply of 12,000 gallons of distilled tar, and about 12,000 gallons of crude tar, for the urban district council.—Mr. R. H. Jeffes, engineer and surveyor, Council Offices, New Malden, Surrey.

BENFIELDSIDE.—January 12th.—For kerbing, channelling, and tar-macadamising, for the urban district council.—Mr. T. Knox, surveyor, Council Offices, Shotley Bridge.

MOUNTAIN ASH. — January 12th.—For road widening, for the urban district council.—Mr. W. G. Thomas, surveyor, Town Hall.

LEWISHAM.—January 12th.—For supplying and laying wood paving, for the borough council.—Borough Surveyor, Town Hall, Catford, S.E.

ROCHDALE.—January 13th.—For making up a street and passage, for the corporation.—Borough Surveyor.

STROOD.—January 13th.—For making up certain roads, for the rural district council.—Mr. L. Randerson, district surveyor, Meopham.

WORCESTERSHIRE.—January 15th.—For the supply of blast-furnace slag, delivered to railway stations and canal wharves, for the county council.—Mr. C. F. Gettings, county surveyor, Worcester.

DUNDEE. January 15th. For [illegible] paving, for the School Board.—Mr. J. H. Langlands, architect, 31 Murray-gate, Dundee.

WORCESTERSHIRE.—January 15th. — For the supply of granite, delivered to railway stations and canal wharves, for the county council.—Mr. C. F. Gettings, county surveyor, 30 Foregate-street, Worcester.

SPILSBY.—January 15th.—For the supply of about 5,000 tons of broken granite, 7,500 tons of broken slag, and 500 tons of chippings, for the rural district council.—Mr. W. Cooke Brakenridge, district surveyor, Spilsby.

UCKFIELD.—January 13th—22nd.—For the supply of road materials, for the rural district council.—Mr. E. W. Ray Johnson, surveyor, Buxted, Sussex.

MIDDLESEX. January 16th. For the supply of granite, tar-macadam, and tar, for the rural district [illegible].

SHEFFIELD.—January 18th.—For the widening [illegible].

SURREY. January 19th. For the supply of first-class granites, basalts, slag, tar-macadam, pitch, tar and tar oils, flints, and fine gravel, for the county council.—Mr. A. Dryland, county surveyor, County Hall, [illegible].

Sanitary.

BULKINGTON. January 31st. For the supply of nightsoil, for the urban district council.—Mr. H. W. Wilson, surveyor, Attleborough, Nuneaton.

MANCHESTER.—January 4th.—For the supply and erection of Venturi meters, cast-iron pipes, valves, and contingent works at Davyhulme sewage works, for the corporation.—Secretary, Rivers Department, Town Hall.

DOVER.—January 4th.—For the collection and disposal of house refuse, for the corporation.—Mr. W. C. Hardy, borough engineer.

COTTINGHAM.—January 4th.—For laying sewers and constructing manholes, for the urban district council.—Mr. J. H. Hanson, surveyor.

MIDDLETON.—January 6th.—For excavating and draining a road on the corporation.—Mr. W. Wild, town surveyor.

BALDOCK.—January 6th.—For the construction of sewers and sewage disposal works, for the urban district council.—Mr. P. Kent, surveyor, Town Hall, Baldock.

STOCKPORT.—January 7th.—For excavating and sewering for the corporation.—Mr. J. Mellor, borough surveyor.

GREAT HARWOOD.—January 9th.—For alterations and extensions at sewage disposal works, for the Joint Sewerage Board.—The Engineers, Martholme, Great Harwood, Lancs.

GLASGOW.—January 12th.—For the supply and erection of distributors at Dalmarnock sewage works, for the corporation.—Mr. J. Dunlop, sewage works department, 72 Ingram-street.

KILKENNY.—January 16th.—For the construction of main drainage, for the corporation.—Mr. J. F. Reade, engineer, 29 Barronstrand-street, Waterford.

PLYMOUTH.—January 18th.—For the construction of [illegible] pipe sewers, with manholes, syphon chambers, flushing arrangements, storm overflows, outfall culvert, and other incidental works, for the corporation.—Mr. James Paton, borough surveyor, Municipal Offices.

DARLASTON.—January 21st.—For the construction of [illegible] pipe sewers, manholes, [illegible] pipes, tanks, filters, and other works, for the urban district council.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

CHAILEY.—January 29th.—For works of sewerage, for the rural district council.—Mr. H. Bertram Nichols, engineer, 11 Victoria-street, Westminster, S.W.

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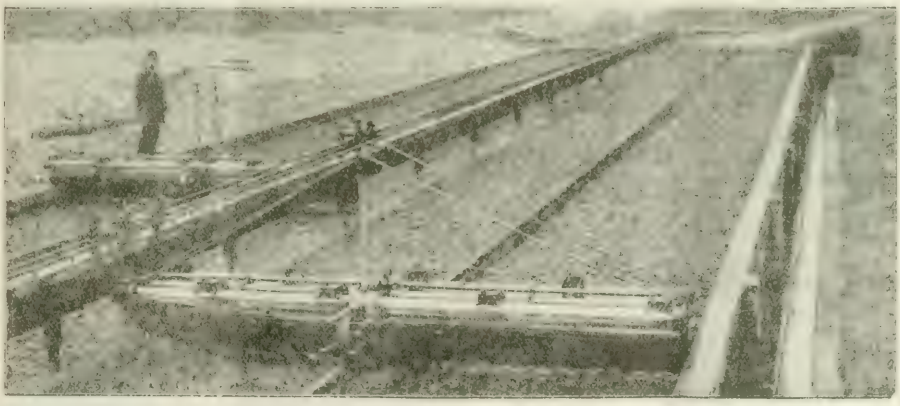

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* Accepted. † Recommended for acceptance
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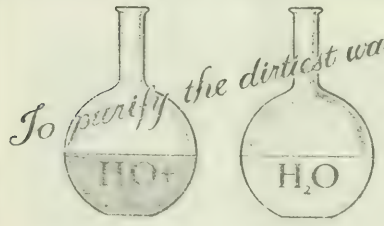

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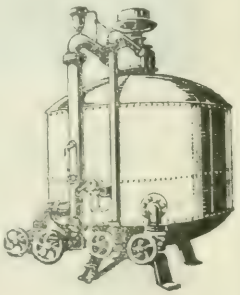

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Minutes of Proceedings.

Housing in 1913-14—(II.).

In continuation of the remarks which appeared in our last issue concerning the report of the Local Government Board on Housing and Town Planning in 1913-14, we now desire to direct attention to the extraordinary progress made during the year in the provision of dwellings by local authorities under Part III. of the Act of 1890. In this, as in every other branch of housing work, something like a boom seems to have occurred since the passing of the Housing, Town Planning, &c., Act, 1909, and the activities of local authorities in regard to building have received an impetus, the ultimate effect of which cannot at present be foretold. Thus, we find that during the year 1913-14 the number of local authorities who obtained sanctions to loans, the number of local authorities who obtained sanction for the first time, and the amounts sanctioned, all exceeded by something like 100 per cent. the numbers and amounts in any previous year since the passing of the Act of 1890. In view of the fear to which utterance is given from time to time in certain quarters that any considerable activity on the part of local authorities in the direction of house building will bring private enterprise to a standstill, considerable interest attaches to that part of the report in which this important question is analysed and discussed. Private enterprise has always been the main source of the provision of houses for the working classes, and in these columns the opinion has frequently been expressed that the local authority should only step in where there has been conspicuous failure on the part of private enterprise to meet the demand in any locality. Figures are not available to show the precise proportion of the new houses suitable for occupation by the working classes built in any one year by private enterprise and by local authorities respectively, but it may safely be asserted that of more than 5,500,000 houses shown in the report of the Commissioners of Inland Revenue for 1913 as exempt from inhabited house duty, not more than about 18,000 have been erected by local authorities. In regard to the incidental advantages of municipal building, the report mentions the raising of the standard of building by the private builder, and the practical knowledge gained by the local authority of the difficulties to be surmounted in complying with their own building by-laws. The latter advantage is apparently not secured by certain authorities, however, who take the easier course of themselves disregarding the by-laws which they enforce upon their competitors. Such disregard of by-laws is, of course, entirely illegal and utterly indefensible.

It must not be imagined, however, that the remarkable progress that has been made means that the gigantic problem of housing reform is within measurable distance of being solved. On the contrary, the reports of medical officers of health, and of the medical inspectors of the Local Government Board, continue to show that in many districts the provision of houses is insufficient or is not proceeding at a sufficiently rapid rate, and that the lack of good houses is hindering the local authorities in the matter of dealing with those which are unsatisfactory. There are many obstacles in the way of progress, and although it is mainly in the agricultural areas that real difficulty arises, the want of activity on the part of local authorities is by no means confined to these areas. The same reluctance to undertake building is to be found in some urban areas where houses are wanted and could be erected to let at rents which the working man would be able and willing to pay without any prospect of a charge on the rates such as there is in the agricultural areas, where the agricultural labourer has been accustomed to pay a rent insufficient to recoup the outlay on the cheapest form of cottage which can be erected even with the facilities afforded under the Housing, Town Planning, &c., Act, 1909. Nor is this reluctance always to be accounted for by the fear that decaying industries or seasons of slack trade may render the houses unnecessary or superfluous. The fact seems to be that in certain districts there is still a strong sentiment in opposition to the municipal provision of houses. Other difficulties arise by reason of the fact that in agricultural areas the persons for whom accommodation is directly needed have not been accustomed to pay an economic rent, while yet further obstacles of a special kind have to be overcome in certain districts, as, for example, the rapid rise and development of some new industry.

We cannot conclude this note without some reference to the hindrance to the provision of cottages which exists in many rural districts in consequence of unnecessarily severe and inelastic by-laws. This is a matter which has received considerable attention from the board, and in many districts revisions have already been made. Further, a number of councils of both urban and rural districts have submitted proposals for revising their by-laws so as to bring them up to modern standards, and the board take the opportunity, where cases of obsolete or defective by-laws are brought under their notice, to urge upon the authorities the need for making new by-laws more in accordance with present-day requirements.

* * *

Compulsory Purchase of Land.

There are few greater authorities on the acquisition of land by public and quasi public bodies than Mr. Andrew Young, and very special interest therefore attaches to the paper on the report of the Land Inquiry Committee which he read at the December meeting of the Surveyors' Institution. In the present state of the law, a special Act of Parliament, or its equivalent, is generally necessary before power to acquire land by compulsory purchase can be obtained. In certain cases, however,

local authorities are empowered by some general statute to acquire land for specified purposes by the mere passing of a resolution. The earliest statute of this kind was the Metropolitan Paving Act, 1817, commonly known as Michael Angelo Taylor's Act, and although the particular procedure under this Act is complicated and unsatisfactory, the principle underlying it is both useful and capable of extension and adaptation to modern requirements. Mr. Young expresses the opinion that it would be perfectly safe for responsible public authorities, including statutory companies, to be vested with general powers, exercisable by resolution only, compulsorily to acquire property required for the proper discharge of statutory duties.

Dealing next with the basis of compensation, Mr. Young pointed out that it is now well established that this should be the value to the owner of the land taken plus any loss he may sustain by its severance from his other lands, or by any injurious affection of such other lands. In some recent statutes, however, and in particular in those dealing with the clearance of insanitary areas, this basis has been modified. Thus in the Housing of the Working Classes Act, 1890, it is provided that if the rental arising from the property is enhanced by user for illegal purposes, or by overcrowding, the enhanced rental obtained by such conditions must be disregarded and a proper rental assumed, having regard to a fair and proper use of the premises, and this adopted for the purpose of calculating the compensation to be paid. Finally, Mr. Young dealt with the tribunal for assessing compensation, which is at present usually a jury of non-experts, although the claimant has the option of having the value determined by an arbitrator. In this respect the Land Inquiry Committee propose a drastic change namely, that in all cases where land is acquired under compulsory powers the final determination of the purchase price, the assessment of the compensation for severance and disturbance due to the claimant, and the apportionment of the compensation as between several claimants, should be determined by a body of Judicial Land Commissioners. Mr. Young agrees that the Land Inquiry Committee have established their case that the time has arrived when there should be an alteration in the normal tribunal for determining price where property is taken compulsorily. In his opinion, however, the scheme suggested by the Land Inquiry Committee is not a practical one, and the best tribunal would be one upon which surveyors would predominate; but, failing this, the general adoption of a single arbitrator, who should have complete powers enabling him to disallow witnesses whom he considers to have been unnecessarily called, as well as any costs he considers to have been caused or incurred unnecessarily.

Portable Chemical Fire Extinguishers.

The British Fire Prevention Committee, after an extensive [illegible] undertaken in July 1913, to meet the then increasing danger of badly made liquid chemical fire extinguishers the defects in which had resulted in fatalities by creating a standard pressure test for these appliances, namely, a pressure test at 350lb. and later in the year a provisional constructional specification was issued. This provisional specification met with the approval of the principal authorities concerned, and has served as a basis for the specifications since issued by several Government Departments and other public offices. Various slight improvements regarding the comprehensive provisional specification have been suggested from time to time, and further experiments have been carried out. The result is that the committee is now able to issue its completed specification, which has come into force as from January 1st, and covers all the general points as to size, strength, precautions against bursting, directions for use, and facilities for testing, of importance in such appliances.

In order to indicate that the committee's requirements are by no means so severe as to handicap the legitimate endeavours of the trade concerned in the production of chemical fire extinguishers, it should be mentioned that various makers are supplying appliances both to public tender and otherwise at a reasonable figure while complying with the requirements indicated in the committee's specification, and the public purchasing such hand fire appliances are thus advised in future to assure themselves that the British Fire Prevention Committee's specification is being complied with in respect to gear ordered. Copies of the specification are now available for free public issue, and lists of appliances complying with the specification will also be shortly prepared. Supplemental to the specification, some recommendations are added as to the maintenance of such extinguishers. The public are, however, reminded that portable liquid fire extinguishers are not the only form of portable first-aid fire appliance, but that ordinary buckets of water together with hand pumps are equally, if not more effective, in the majority of cases, and, further, have considerable advantages for ordinary household, office, shop and factory purposes.

Up-to-date Advertising.

It is frequently asserted, and usually not without good reason, that the British manufacturer, when he ventures to embark on a publicity campaign in other countries, fails lamentably in the all-important matter of the style of the advertisements which he frames in his endeavour to secure business. It would appear, however, that the "Eric" (Patent) Water-main Scraper Company, Limited, of Chepstow, Mon., whose now well-known machine, it will be recollected, was the subject of one of the papers read at the last meeting of the Institution of Water Engineers, are determined that something more than the mere announcement of their name and address is necessary in appealing to the American buyer, as witness the following advertisement which has been drafted for use in a Transatlantic engineering journal:

WHO SAID WATER-MAIN CLEANING?
We Can Save You Thousands of Dollars!

We can, and will, come over and clean your mains more efficiently, more quickly, and for less cash than you would have to pay any other water-main cleaning firm.

The explanation? Why, that's easy!

We have a machine patented in the States and other countries, that cleans mains by miles, not by yards or feet! Our machine is not antediluvian. It is not pulled through pipes by donkey winches. It is operated by the normal pressure of water in the mains and is self-propelled, whatever the pressure may be or little or no capacity, we don't have to equip you with a hundred horse-power engine and make a mess of your premises. We just run our machine on to the most suitable hydrant for getting rid of the mud.

We can't tell you more about it in the advertisement; we want you to mail or wire us for full particulars. It will be worth your while. We can quote you from here if you will tell us frankly all about your work; but it must be *big work*, you will understand, to bring us over.

You can get a copy of our booklet on "Water-main Cleaning Extraordinary" from the publisher of "Fire and Water" free for the asking. Please do this, and then write us. You will see why!

THE ERIC PATENT WATER-MAIN SCRAPER CO., LTD.,
Chepstow, Mon.

It must be conceded, after reading the above, that the Eric Company possess not a little of the pushfulness of the wonderful little machine that bears their name, and that they, at any rate,

council be a matter of doubt to appreciate the value of a sensible municipal engineer.

* * *

The Air Space above Streets.

In our recent remarks on the subject of the Liverpool Corporation Act, we pointed out that the statutory right of an urban authority to erect posts in their city streets in such a manner as to obstruct the public use of the streets for [illegible] was [illegible] to apply to the case of the Overhead Wires Act, 1908. In *Blount v. Bristol Electric Tramways Company* ([1902] 1 Ch. D. 565) it was held that the board had no proprietary interest above the street except when necessary to protect the street and the traffic from [illegible] or danger, or to enable them to exercise their powers in the street. Therefore the Court refused an injunction against the erection of a telephone wire stretched across a street at a great height, and causing no appreciable danger to the public. This was followed by *Finchley Electric Light Company v. Finchley Urban District Council* (1907, 1 Ch., 437) where the company carried across a street at a height of 30 ft. two posts and to support a cable carrying a supply of electricity to the house of a customer. The street was an old turnpike road, which had been converted into a turnpike trustee, and some [illegible] was made by the council to show that, for technical reasons, the principle did not apply. But the attempt did not succeed. It was held that the extent of the "area of user" was a question of fact, and that so long as the company did not encroach beyond that area they were entitled to carry their wires across the street. But for the purpose of the exercise by the local authority of their own statutory powers of lighting the district, the area of user may extend above that required for strictly highway purposes. This is shown by *Farnham Local Board v. Smith* (90 L.T., 467), in which the board contracted with an electric light company for the lighting of their district, and the company, in pursuance of their contract, erected posts in, and carried wires over, a street. The defendant, who claimed to be the owner of the subsoil of [illegible] the road, threatened to remove them, but an injunction was granted restraining him from so doing. Thus it will be seen that the limits of the "vested" area are not more definite in an upward than they are in a downward direction, and may differ in different streets and under varying circumstances.

* * *

Irish Councils and Cottage Building.

We learn from the *Irish Builder and Engineer* that at the last meeting of the Callan (co. Kilkenny) District Council it was reported that a considerable quantity of the council's property, in the shape of building materials, had been stolen from the sites of new cottages now being built by direct labour. It was stated that the loss had been reported to the police, but that no one had been made amenable. The clerk of the council stated "that if the council had taken his advice the council would not have touched 'direct labour' cottages again, as they had proved a failure all over Ireland." A member of the council stated that the Callan Council would not again touch direct labour cottages. It was stated that, in consequence of the slates being delivered before the cottages were half built, they were lying there a full year, and quantities of them were stolen. A considerable difficulty appears to arise in regard to getting the cottages built, and in some cases cottages were built and the timber on them left exposed for six months. This state of things may be due to a variety of causes, each more or less connected one with the other, or it may be due to a combination of causes under the influence of local economic conditions. It would surely be deplorable, however, if the [illegible] of the Irish Councils [illegible] cottages could be shown to be [illegible] cates claim for it. Its success depends largely upon the constancy and efficiency of the supervision that are bestowed upon it, and it ought not to be beyond the power of [illegible] that the supervision is duly exercised. It is not without significance that in another direction, that of road work, the tendency in Ireland, under the advice of the county surveyors, is to extend the [illegible] of road labour owing to the satisfactory results obtained from contract work. Anyway, if there is any real ground for the [illegible] of the clerk to the Callan Council in the matter of cottage building, there would appear to be ample room for a [illegible] inquiry into the cause or causes of the evil.

Military Earthworks.

In view of the possibility [illegible] called upon to carry out entrenching or similar works for the military authorities, the subject of military earthworks, upon which Mr. Bertram Hartfree writes in another column, is of considerable present interest. In modern warfare some form of cover is an absolute necessity, and if, as is usual, the character of the ground upon which operations are in progress does not afford natural places of concealment, entrenching and the construction of earthworks must be undertaken. The object of the simplest form of artificial cover in open country is for the individual soldier to secure a screen from which he can deliver a powerful fire on his foe, but which at the same time will, as far as possible, [illegible] It is, of course, a long way from this simple construction to the complete trench, tunnelled under, with recesses for storing food and ammunition, and a "Savoy Hotel" for rest and refreshment, which is now in common use at the front. But the principles are the same namely, shelter and concealment. In Mr. Hartfree's article certain simple rules will be found for the guidance of the municipal engineer in constructing such works, and in the effective disposition of obstacles, by the use of which the value of defence works can be greatly enhanced.

* * *

Waste Liquors from Paper Mills.

The second of the series of articles upon the treatment of trade wastes, which appears this week on another page, indicates some of the difficulties which are encountered in the disposal of the liquid wastes from the trade of paper making. Undoubtedly much can be done by the manufacturers themselves, often at very little or no expense, and in some cases with profit, by treating their wastes for the recovery of fibre and soda, which would otherwise be wasted. All these wastes are sterile, and do not lend themselves to biological treatment, as stated in the article, so that improvements can only be made by discovering methods of settlement and straining by chemical and mechanical means which shall be more efficient than those at present in use. Any process which would get rid of the resultant sludge more [illegible] would also be welcomed.

* * *

"The Surveyor" Special Issue.

We recently made a request in this column that returns of municipal works projected for 1915 should, in order to ensure their appearance in our forthcoming Special Issue, be despatched to us without delay. While the response to this appeal has been in every way satisfactory, we would urge upon those of our readers who have not yet submitted their forecasts to arrange that these shall reach us in the course of the next few days.

The Purification of Waste Liquors from Paper Mills.—(2).

By G. BERTRAM KERSHAW, M.AM.SOC.C.E., M.INST.C.E., Late Engineer to the Royal Commission on Sewage Disposal.

The treatment of wastes resulting from the manufacture of various kinds of paper is a matter which frequently demands attention in various districts. There is a large number of mills running in this country, most of them lying in Lancashire, Kent, Buckinghamshire, and Aberdeenshire, though they occur in many rural districts where there is a sufficient and suitable "water privilege."

Very many different types of paper are made, such as writing and drawing papers, newspaper, wall and blotting paper, brown paper, &c. As a general rule, one mill turns out one particular type of paper only: thus, a "brown" mill will confine its operations to the production of various qualities of brown paper; a "news" mill generally manufactures wood-pulp papers, or papers chiefly of wood pulp with a little esparto grass; while "white" mills make various qualities of writing papers, using esparto or rags, or both.

The nature of the raw materials employed in making the paper naturally influences very largely the character of the waste liquids produced; consequently some mills have much more difficulty than others in treating their wastes. For example, "brown" paper mills generally employ as their raw materials old sacking, ropes and tarpaulin, peat, straw, waste coloured papers, and dirty waste pulp from other mills, and the waste waters from such mills are difficult to purify efficiently. On the other hand, mills producing high-class notepapers, and employing esparto and rags, with sometimes a little wood pulp, produce liquid wastes which, with the exception of the kier liquors, are more amenable to treatment. Newspaper mills, whose staple material is "chemical" wood pulp, turn out wastes which are probably easier to deal with than those derived from any of the other branches of paper manufacture.

The bulk of the wood pulp used in this country is imported from Scandinavia and Canada, and during the early stages of the present war it was very noticeable how the newspapers diminished in size, owing to the shortage of imported wood pulp. "Chemical" pulp, it may be noted, does not require bleaching. It may be observed, in passing, that there are in this country three or four sulphite cellulose mills which manufacture wood pulp by the sulphite process, and the waste liquors they produce are excessively polluting; but as these mills are so few in number at present, they need not be further considered here.

A large and clean water supply is essential for the making of white papers, sometimes as much as 200,000 gallons of water being used per ton of paper produced, where the water supply is abundant and the quality of paper made is a high-class one; as a general rule, however, the average volume of water used per ton of paper would be something like 50,000 gallons, and it is sometimes very considerably less than this in the case of low-grade papers and where water is scarce.

Several "white" mills, owing to pollution of the river from which they draw their water supply, are forced to purify the raw river water before it can be used, and in one particular instance the cost of so doing amounts to no less than £1,000 per annum.

The various processes and details of paper making are somewhat complicated, and methods and machinery differ in almost every mill, since the type of machinery and processes used depend largely upon the class of paper made; for example, the machinery of a "news" mill is designed to deal rapidly with wood pulp, but a mill turning out high-grade writing papers uses machinery designed to work at a lower speed, since long-fibred materials such as esparto grass and rags are used.

It is necessary to go into the various processes of paper-making at some length in order to grasp the many and varying difficulties with which a manufacturer may have to cope, and to realise that one particular branch of the trade may have problems to encounter that do not exist in another section of the trade.

It should be carefully borne in mind, when reading the paragraphs describing the actual making of the paper, that it is rarely the case that a precisely similar procedure is followed in any two mills, even when using the same raw materials and producing a similar class of paper.

It will probably be of most interest to give a brief description of the usual kind of operations employed for the manufacture of high-grade white papers.

Such a mill will employ mainly esparto* and rags, with possibly a little wood pulp, and the processes to which the materials are subjected are generally as follows, viz.: rags sorting, cutting; rags and esparto—dusting, boiling, pulping, making into paper, calendering, and cutting. The process of pulping comprises washing, breaking, bleaching, pressing and beating.

The rags are first of all sorted and cut (usually by hand in the case of note papers) into pieces about 3 in. to 4 in. square; in the case of lower-grade papers this operation is usually effected by machinery.

The cut rags now pass on to the machine known as the "willow," where the rags are tossed about in revolving drums containing iron spikes, the dirt being shaken out of the rags. After leaving the "willow" the rags are fed into the "duster," which consists of a revolving cylinder, covered with wire mesh, and provided internally with spikes, which toss the rags, freeing them from the dust, which falls through the cylinder meshes. The esparto grass duster is a machine resembling a combined willow and duster; rather large quantities of dust are produced from esparto, and this can be either burnt or mixed with the sludge resulting from the purification plant.

The next process consists in boiling the rags or grass fibre in "kiers"—*i.e.*, steel digester boilers—with a solution of alkali, to free the cellulose matter from dirt, grease, silica, gum, &c., and also to soften the fibres. Only about 45—55 per cent of the esparto can be utilised, the remainder being waste.

Both rotary and stationary boilers are used for rags, while stationary boilers are generally employed for esparto. The boilers are usually of sheet steel, and work under a pressure of some 45 lb. per square inch. Access doors are provided at the top and bottom of the boilers.

The esparto grass is placed in a kier at the same time as the alkali solution, or sometimes the soda is introduced in solid form, from 15—20 per cent of the weight of the grass being used; the top door is then shut and steam turned on for several hours, after which the alkali solution is run off—usually to a tank supplying the evaporator used for soda recovery—and hot water is run into the kier for washing purposes, this also being shortly afterwards run off to the evaporator. Esparto grass is usually boiled twice.

The kier liquors or "boilings" are excessively alkaline and polluting liquids, the first boiling being naturally much the stronger.

As a general rule, processes are in use at most mills for recovery of the soda from the boilings and first two wash liquors in the case of esparto grass, where, however, rags alone form the raw material, the boilings are rather dilute for profitable recovery. As much as 75 per cent or more of the soda is sometimes recovered, multiple-effect evaporators, such as the Porion or Yaryan, being used, and the residues incinerated.

The boiler, or kier, is next filled up with cold water, in which the grass stays until it is required, when the water is run off to waste, or else pumped up to an overhead tank, to be heated and used for the next batch of grass.

The kier liquors amount to some 3,000 to 4,000 gal-

* Esparto grass is a harsh, wiry grass, which comes chiefly from Algiers and Spain, being imported in bales. It closely resembles "marram" grass in appearance, a well-known grass growing on sand dunes and sandy soils by the sea.

lons of water per ton of esparto, and often less in the case of rags. It may be said at once with regard to these alkaline kier liquors that so far, no biological process is known which will deal with them efficiently and economically when they are too dilute to admit of profitable recovery. Being strongly alkaline they contain many solid matters in suspension and in solution, and give a high figure for oxygen absorbed.

On removal from the kier the fibre is washed, and then passed forward to the washing and beating engines, through which water is constantly passing, and it remains here until the washing process is completed and the kier drains are next opened up, after which it is known technically as "half-stuff." Very little colouring matter can be got in the foregoing process, and the amount of alkali as would be expected, is fairly high.

Bleaching is the next operation, effected by a solution of bleaching powder prepared in a special tank provided with mechanical agitators; from this tank the solution flows to a settling tank, where it remains for some hours, until the solution becomes quite clear. The bleach is then run into the washing [illegible] and the roll revolved. After the bleaching process has been in operation for some time a small quantity of sulphuric acid is added to assist the action. The bleach is finally run off and the fibre washed.

After bleaching is completed, there are several methods of dealing with the "half-stuff" before it passes to the beating engines, one of the principal of which is the direct system, or the ground pate; but in the direct system the fibre is run straight from the breaker to the beater. This machine resembles the breaker, but the roll is provided with additional bars, and rotates at a higher speed.

The beating process is complete in from three to ten hours, any colouring or loading materials—*e.g.*, china clay—being added in the beater.

After passing through the beater, the pulp is termed "stuff," and it is passed to the storage tanks or stuff-chests ready for the paper-making machine, termed the "Fourdrinier." From the stuff-chests the pulp is raised to a supply tank connected up to the mixing box, where water is added, and the pulp is passed over sand tables or strainers overlying a vat, the effect of this being to remove knots. The fine pulp passes from the vat to the paper-making machine.

This machine is rather elaborate; very briefly described, it consists of an endless band of woven wire cloth constantly travelling in the same direction in a horizontal plane, and supported by tube rollers at intervals. A lateral vibratory motion is given to the band as it travels along, which has the effect of interlacing and felting the fibres while they are floating in the water. The "stuff" from the [illegible] into a delivery box running the whole width of the band and is delivered [illegible] over the band is in contact with the rollers. This water (termed "machine" water) is caught in trays placed beneath the machine, and leading to a storage tank. Suction boxes are provided underneath the wire band at a point where the water has almost ceased to drain off at the tube rollers.

Large quantities of "machine" water are produced; it is frequently reused or also passed through "stuff catchers" or "save-alls," which are mechanical contrivances devised to retain the fibre or pulp while passing off the clear water.

The sheet of pulp now passes between "couch" rolls, where the actual manufacture of the paper terminates.

The remaining processes consist of pressing and drying, the continuous sheet of paper passing through two sets of rolls which express the water, and smooth first the top side and then the under side of the paper. The drying cylinders are supported in framing and are heated by steam, the heat gradually increasing as the finish of the process nears. "Felts" are used on most of the cylinders to keep the paper flat and to assist in conserving the heat.

After leaving the drying cylinders, the paper is surfaced by passing it through a stack of calendar rolls, after which the paper is wound upon rolls or drums, and the process is complete.

Turning to the waste liquors produced, the kier liquors, though comparatively small in volume, are always grossly polluting, and especially those derived from the boiling of esparto. The remaining waste waters comprise those resulting from the processes of washing, breaking and bleaching, together with the machine water and washings from various floors. These often contain colouring matter (at mills where coloured papers are made) with various "loadings," and the combined waste waters are consequently often highly coloured.

Concerning the kier liquors, it has been already mentioned that where a strong solution of soda is used—*e.g.*, for esparto grass—the boilings and first and second washings are almost invariably evaporated and incinerated for soda recovery, which is a process which pays; but it must be borne in mind that the cost of upkeep of the recovery plant is heavy, especially as regards the incinerator, and where a weak soda solution is used as in the case of rags—recovery apparently does not pay, and the kier liquor is usually mixed with waters from the other processes, the mixed wastes being run into settling tanks, a precipitant being sometimes added, while in some cases this is supplemented by straining through filters.

It is very advisable that when kier liquors are mingled with the rest of the water it should be [illegible] and not in [illegible].

It is of interest to note that the Rivers Pollution Commission, in their first report, point out that "the greater part of the alkaline liquor of the paper-maker might, with profit upon the operation, and certainly [illegible] the soda, even in the smallest mills, and under the most unfavourable conditions, and thereby relieve the river of this form of pollution."

It is not quite clear from the context whether the commission include dilute kier liquors in this statement.

The following figures of analysis, due to Mr. E. Halliwell, F.I.C., and taken from vol. iii. of the Seventh Report of the Sewage Disposal Commission, show the nature of the crude liquids before treatment derived from the manufacture of various kinds of [illegible]

	Solids.	[illegible]	[illegible]
[illegible]			
Do. do.			
[illegible]			
[illegible]			
[illegible]			
Crude liquors.			

It will be noted how extremely variable are the foregoing figures, and also that the main difficulty in treatment is likely to arise from the solids, both in suspension and in solution. Further, it must be remembered that paper mills discharge very large volumes of waste waters, 1,000,000 gallons and upwards per twenty-four hours being by no means uncommonly met with.

On the assumption that the strong kier liquors are treated for recovery, well-designed settling tanks, with facilities for employing chemicals, will effect a removal of a very large amount of the suspended solids together with a proportion of the solids in solution, and in most instances such a tank liquor, if not containing more than, say, 5 to 7 parts of suspended matter per 100,000, can be discharged to the river or stream without further treatment. A "brown" mill, however, would probably have difficulty in getting down to these figures, while for a mill using solely wood pulp they would be lenient. Unfortunately, in some cases space for tanks is virtually unobtainable. Alumino-ferric gives good results when a precipitant is needed, but in special cases careful straining through filters of fine material is called for in addition to tank treatment.

It is of distinct advantage if the various wastes can be stored before tank treatment, in order to equalise their varying strengths, characters and temperatures.

Tilmans recommends separate treatment of the various wastes, but in the case of many existing mills it would be a very costly and difficult business to alter the whole of the waste liquor drains in order to keep any special liquor apart from the general mixed wastes, with a view to special individual treatment. At one mill with which the writer is acquainted

the foundations rest upon solid rock, and the cost of redraining such a mill would be very heavy. In the case of a prospective mill the question of separating certain of the liquids—*e.g.*, separate treatment of the waste waters from the breakers and beaters, and also of the machine water—should receive careful consideration, and would probably enable the paper-maker to re-use the settled sludge or pulp.

Many paper mills already possess a very large tank capacity, but it is of little use having tanks unless these are properly attended to and regularly cleaned out, and this is where the shoe often pinches. Paper mills produce very large quantities of sludge, and there is often little enough room to spare for its reception after removal from the tanks. In the case of mills employing wood pulp, care is usually taken to save any pulp, either for re-use in the same mill, if clean, or for disposal to other mills producing papers of inferior grade. Frequently, when all the waste waters are mixed together, the sludge is pressed and tipped, or simply tipped in the semi-liquid state. Where practicable, well-drained lagoons assist very greatly in hastening the drying of the sludge, and the objections often applicable to lagooning sewage sludge do not apply so much here.

Some idea of the volumes of sludge produced annually may be gathered from an extract from the evidence of a witness examined by the Sewage Disposal Commission (Seventh Report, vol. iii.). Thus, Mr. J. H. Annandale stated that, in his own case, the waste products (from a small mill), consisting of solids from the machines—bleach, lime, and carbonate of lime from re-causticising the recovered soda—amounted to something like 3,500 cub. yds. per annum. The sludge, which contains a certain amount of lime, can be used as a manure, but it is sticky and difficult to manipulate.

The writer caused some experiments to be carried out with a view to utilising paper-mill sludge for raising heat. Esparto sludge was employed, and gave very promising results when carefully dried, but it was found that the moisture in the sludge, as with sewage sludge, militated against its employment as a fuel.

The main point in the treatment of waste waters from the majority of paper mills is ample tank capacity, well-designed tanks, and, most important of all, frequent attention for cleaning purposes, without which no system will give good results. The temptation to run tanks for too long periods is, of course, great, since it means less sludge production; but it is bad for the river which receives it. In many trades recovery of what were formerly regarded as wastes is becoming more general, and a manufacturer frequently finds nowadays that in the past he has been throwing away valuable material, the recovery of which not only often pays for the cost of recovery, but yields in addition a handsome profit.

Mr. Kershaw's next article will deal with the subject of tannery wastes.

American Road Congress.—The fourth American Road Congress held in Atlanta, Ga., recently, is claimed by the United States Press to have been the greatest good roads meeting ever held in any country in the world. The convention was held under the direction of the American Highway Association, the American Automobile Association, and many other national and state bodies. Mr. Logan Waller Page, president of the American Highway Association and director of the United States Office of Public Roads, pointed to the fact that during 1914 more than 18,000 miles of hard surfaced roads had been constructed in the United States—more than three-fourths the length of the entire national road system of France. He urged that greater efficiency be sought, and he believed it possible to save from the annual expenditure, now reaching more than £41,000,000 a year, at least 25 per cent, or £10,000,000, through efficient management.

A SHEFFIELD IMPROVEMENT.

LOWERING OF ROADWAY UNDER RAILWAY BRIDGE.

The accompanying photographic view illustrates an important piece of work at present in hand in Brightside-lane, Sheffield, under the supervision of Mr. W. J. Hadfield, the city surveyor.

It consists of lowering the roadway under the recently reconstructed Midland Railway Bridge, so as to give an increase of about 3 ft. 6 in. in the height from road level.

Brightside-lane is the direct route from the city to practically the whole of the east-end works, and hitherto great inconvenience has been caused owing to the fact that the limited headway has prevented anything larger than single-deck cars from being run under the railway bridges. There is a heavy workmen's traffic, and double-deck cars have been badly needed.

As the Midland Railway Company intended to reconstruct the bridge, arrangements were made with them to put in deeper foundations so as to permit the lowering of the roadway, and the work is now well in hand.

As the excavation was started only a few days ago, and the roadway was not closed until Monday, December 28th, the photograph will give some idea of the speed at which the work is being carried out. It will be noticed that one of the new tramway tracks is already laid for its whole length, and it is expected that the road will again be available for traffic within ten days of the date upon which it was closed.

BRIGHTSIDE-LANE, SHEFFIELD.

ENGINEERING DIFFICULTIES.

Numerous gas, water and other mains have had to be diverted, the goods yard of the Midland Railway Company has had to be lowered, and as this part of Sheffield is almost dead level, numerous questions affecting drainage have arisen. Special arrangements have been made to prevent flooding under the bridge, and, though it cannot be guaranteed that flooding will never occur during a deluge of rain, it is fully anticipated that any ordinary downpour can be dealt with by the means which have been provided.

The cost of lowering the roadway, relaying the tramways, and altering the various underground pipes will be from £2,500 to £3,000. There are other matters making up the whole cost of the scheme to the corporation to about £4,000, in addition to which the Midland Railway Company has paid for the necessary alterations to the bridge structure. In view of the fact, however, that the journey to Brightside per double-decked car will be shortened by half a mile, it is considered that the future saving, not only in running expenses, but also in journey time, amply justifies the expense.

Institute of Sanitary Engineers.

MR. A. P. I. COTTERELL'S PRESIDENTIAL ADDRESS.

At Caxton Hall Westminster on Wednesday [illegible] Institute of Sanitary Engineers [illegible] Mr. A. P. I. Cotterell [illegible] the chair [illegible] Mr. J. D. Watson [illegible] Mr. Cotterell [illegible] The day when the sanitary reformer was brushed aside as an impossible theorist is long past. Sanitation is now recognised as essential to the world's well-being [illegible] Man is a gregarious animal, and, whether in city or village [illegible] is she wherever civilisation spreads.

But if sanitary engineering has been recognised in peace, no less has it found its place in time of war. The experience of [illegible] death may be prevented by its aid. So much is this the case that [illegible] We are glad to know that one of our valued ex-presidents and many members of the institute are serving their country in this beneficent capacity. It is a satisfaction in these days of human slaughter—without precedent in history to realise that [illegible] important part, not in destruction, but in preventing or at least reducing some of the awful miseries of war.

Somebody has said that much of the trouble in which Europe is now involved is due to our bowing down to the "little god of progress." I suppose he meant that we have [illegible] by material rather than by moral progress. Still, in sanitary work there is no such distinction. Material improvement in this direction is immediately followed by moral gain. The provision of a public water supply or the drainage of a town may seem a prosaic piece of work, but these [illegible] a higher standard of cleanliness among the inhabitants, a widening of the social and moral outlook, and a confirmation of the axiom that "cleanliness is next to godliness."

WATER SUPPLY.

I should like briefly to review some of the progress made by sanitary engineering in our own land during the last four or five decades. There have been astonishing changes. Forty years ago few beside the larger towns had an adequate water supply and the conditions even in some of those left much to be desired. Now almost every town and many villages have their public water supply; the large towns, concurrently with an influx of population, have improved theirs out of recognition; lakes have been constructed or tapped to provide for the wants of densely populated cities, while many others are drawing far afield upon the resources of the country. London stands by herself. She has enormously increased her reservoir accommodation, and is engaged in still further extensions for the purpose of utilising to the full her [illegible] quality of the water.

[illegible] the front the value of the various sources of supply, [illegible] alive to the financial advantages of their position, and [illegible] royalty.

This greater demand for water and the comparatively limited number of pure sources of supply in a thickly populated country like England has of late years brought forward the question as to whether we are making the best use of them; whether, in fact, a water survey ought not to be undertaken. In my opinion such a survey is not only desirable, it is highly essential, and ought to be undertaken by some such central body as that proposed by the Royal Commission on Sewage Disposal. On it should be laid the duty of not only conserving the sources of supply, but of so regulating them that each shall be used to the best advantage.

SEWERAGE AND SEWAGE DISPOSAL.

In the department of sewerage and sewage disposal even greater advance has been made than in water supply. In one sense the art of sewage disposal may be said to have been created in the last forty years. I do not mean that before this period very little was known of the principles of sewage disposal, for I am one who holds that the past has much more to teach us than we are generally ready to admit. But there has been material advance with more and more confident step. Forty years ago only the larger towns [illegible] villages are provided. Then the disposal of sewage was at the best embryonic, except in a few enlightened instances; now we can design disposal works with practical certainty that they will fulfil the purpose intended if properly looked after.

As my predecessor pointed out last year, there is still much to be done in sewage disposal. In this brief survey I cannot attempt to go into detail, but I may refer to one or two directions in which work is being done and where more ground yet remains to be covered. One of them is in the elimination of smell. This, the bugbear of the sewage works manager, is often the protest of badly laid drains and sewers crying aloud for remedy. Various appliances have been introduced upon the sewers with the object of deodorising or destroying the offensive constituents of sewer gas, some of them distinctly ingenious in their character. The question of smell was dealt with in the Fifth Report of the Royal Commission on Sewage Disposal, but no satisfactory process can be said to have arisen as a consequence. The only one mentioned—viz., the introduction into the sewage of oxychloride—was so expensive as to make it prohibitive for any but extreme cases. Lately, however, efforts have been made to revive a practice advocated nearly thirty years ago of blowing air into the sewage. Mr. J. D. Watson, in a communication to the last congress of the Royal Sanitary Institute, recounts some experiments undertaken by him in this direction, which appear to promise a measure of success, the basis of the proposal being the saturation of the sewage by air blown in under pressure to prevent the formation of sulphuretted hydrogen gas.

It is in the utilisation of sludge that the greatest activity is at present being shown. After the disappointments and losses that have been the lot of investigators in years past, it is not surprising that a few years ago the search was almost given up, and every effort made to get rid of sludge in the quickest and cheapest possible way.

But "hope springs eternal in the human breast," and the very failure in a field that ought to be conquered has led others to renew the attack.

You remember that allegory of Olive Schiemer, where she depicts the hunter striving to climb the Mountain of Knowledge although the way gets steeper and steeper, and he knows that he must die before he reaches the summit; yet he is well content if he has built the steps up which another can gain still higher ground, while it may be that [illegible]

the bird he seeks will flutter down upon him at the end. Perhaps something of this spirit can be claimed for the humble sewage expert even though his efforts are only on behalf of such mundane stuff as sewage sludge.

Utilisation of Sewage Sludge.

The notable success of Bradford in transforming the greasy constituents of its sewage into a source of revenue has had an effect in drawing attention once more to this wasted source of national revenue. At Bradford, I understand, the recovery of fats produces so large an income that much of the annual upkeep of the works is thereby paid for, and the authorities go out of their way to encourage the introduction of trade wastes from the factories into the sewers.

Another scheme for the treatment of sewage sludge was described by my predecessor in this chair. It is in operation at Dublin and is, I understand, to be introduced shortly on a large scale at Birmingham. Mr. Watson described the process so fully in his address that I need not again particularise; suffice it to say that it consists of two main sections:—

(1) Fermentation of the crude sludge by the addition of yeast with separation of the resultant water, which in this case is drawn from underneath the thick [illegible] the fermentation.

(2) Drying the sludge after the incorporation of phosphates and potash, and its conversion into a fertiliser.

I have had occasion recently to examine professionally a method of sludge utilisation that is being worked by a company who have lately erected a plant at Wimbledon capable of dealing with 25 tons of sludge per day. This undertaking boldly sets out to recover the valuable constitutents of the sludge, and claims that effective uses can be found for all of them.

The sludge to be treated is first sprayed with petroleum; it is then distilled in retorts arranged in two series at increasing temperatures. Chemical changes are thus effected on the organic matter, oils, ammonia and gas being produced, while a carbonaceous residue is left in the retorts. The petroleum used is recovered with the sewage oil.

The promoters claim that a profit can be made from the sale of the resultant products—oil, pitch, ammonia [illegible]. The crux of the process lies in the use that can be made of the latter constituent. It is valuable in a number of manufactures varying from electrodes to printers' ink, and it may be used as a precipitant of the raw sewage itself.

By repeatedly precipitating raw sewage with the residue, and distilling the sludge cake, the phosphoric acid content is increased, so that after use, say, three or four times, a valuable manure is obtained.

Another feature claimed is that by such precipitation the effluent is so clarified that the work to be done in subsequent filtration is reduced.

Manchester Experiments.

Manchester has just brought to our notice still another process. It has several points of novelty in that it proposes so to perfect the preliminary or tank treatment of sewage as to do without filtration altogether.

The proposal is certainly interesting. By blowing air under pressure into sewage sludge, or, better still, into the slurry or humus obtained from filter and [illegible] an activated sludge is obtained containing a high percentage of nitrogen and capable, when mixed with raw sewage in the proportion of 1 to 4, of rapidly precipitating the latter, the whole contents being all the while subject to aëration from air blown in either through pipe tuyeres or through porous tiles. A plant has been installed at [illegible] gallons a day. [illegible] been [illegible] and one and a-half hours' settlement, the resultant effluent [illegible] described oxygen and nitrate tests, that no filtration whatever is required, but merely ponding before discharge.

One of the most interesting features is that the sludge, when thus oxidised, appears to be capable of acting upon sewage much in the same way as an aërobic filter. At the same time, by activation, the [illegible] grown, and the sludge is thus enriched to three times its former manurial [illegible] being used as a fertiliser after it has been reduced in bulk by drying.

I have [illegible] proposals to show the keen attention now being devoted to this phase of sewage disposal. All of them, it will be seen, aim more or less directly at restoring to the land some of the nitrogen that we are now so wastefully throwing into the sea, whence we only get a return, and that to a very limited degree, from the fish caught.

Royal Commission's Work.

It is needful to pass on; but before doing so, I ought not to omit mention of the notable work done by the Royal Commission on Sewage Disposal. They have been a long time about it, but they have certainly left their impress on the problem. Much of their work may have been merely to systematise existing methods, but their last report strikes out much more boldly in that it proposes to resume the discarded method of purification by dilution, and to introduce sewage into the streams in a more or less crude form, under scientific control, relying upon the previously ascertained oxygenating resources of the river to complete the purification. Although other countries less crowded than England may do this kind of thing, yet it seemed that here at any rate the door had not only been closed, but banged and bolted by legislation. If it is to be reopened, well-balanced discrimination will be needed to decide what shall and what shall not be allowed to pass through, and it confirms the need already mentioned of an efficient river authority.

Refuse Disposal.

I ought not to allow this portion of my subject to go by without drawing attention to the great advance that has taken place in the disposal of refuse. Those appalling heaps of rubbish that used to disgrace the thickly populated portions of our cities are not so numerous as they used to be. Dickens' golden dustman is becoming a being of the past. Any gain he may have made must have been at the loss of the community who supported him in stunted infant life and much disease. One of the finest sanitary developments of modern times has been the institution of the destructor. We have come back to the ancestral use of fire for the disposal of our refuse; may it be our fortune to see it extend to the disposal of our dead, and so revert to a practice in which our forefathers were wiser than we.

Sanitation and Health.

Dealing with the question of sanitation generally, the question has more than once been asked: Does it pay? The most direct reply is an examination of the death-rate, which has certainly fallen most remarkably. In 1871 to 1875 the annual death-rate of England and Wales was 22·0 per 1,000. In 1913 it was only 13·7 per 1,000. The drop in some of the principal epidemic diseases is very notable. In the period 1871 to 1880 the small-pox rate was 0·24 per 1,000; in 1913, it was 0·00 per 1,000. Scarlet fever has dropped from 0·71 to 0·06. Typhus has practically disappeared for some years, while enteric fever has come down from 0·32 to 0·04.

It has been shown, I believe from this chair, what a gain to the country in the money value of life these statistics indicate; but beyond this there is the increased efficiency of the population, a higher standard of health and of general well-being, all of which go to show that sanitation has been well worth the trouble and expense that has been devoted to it. In all this we, as sanitary engineers, may justly claim to have had our part, and may be proud that our life work lies in such a beneficent direction.

Housing.

And now I want to invite your attention and sympathy in a new direction. It is not easy, as you can well imagine, to find fresh material for an address when I have to follow so many able exponents of the art of sanitation, so I am going to break fresh ground, and propose to ask you to consider with me the problem of housing in so far as it affects the poorer classes of our people both in the city and in the country. I submit that it is a subject not only germane to the aims of the institute, but one in which we have a direct interest. We touch it as citizens, but we also come in contact with it in our profession. It will fall to the lot of many to assist in the solution of the problem, and just as we have had our part in improving the sanitation of the country in the past, so we ought also to find a place in the future in helping toward the provision of better houses for the people.

There is another way of looking at the subject. While we have been engaged in works of water supply

... and wider streets ... have ... proved ... more difficult to the small house-holder ... to the ... for ... [illegible] ... the ... [illegible] ... [illegible] ... [illegible] ... [illegible] ... than the rich.

... [illegible] ... [illegible] ... [illegible] ... [illegible]

Institution of Water Engineers.

WINTER GENERAL MEETING IN LONDON.

(Conclusion.)

The following discussion took place at the recent winter meeting of the Institution of Water Engineers on the presentation by Mr. Charles W. S. Oldham, borough waterworks engineer, of a paper reproduced in last week's issue—describing

THE WHITTON PUMPING STATION, IPSWICH CORPORATION WATERWORKS.

Mr. H. Ashton Hill (Birmingham) said the plant described was a very interesting example of pumping plant. It was a type of plant similar to one that he himself was considering for a client some two years ago. It was to deal with a capacity of 1,500,000 gallons a day, and the lift was about 300 ft. The water level was about 250 ft. down. He was advised by people who had experience of this sort of thing that they would not entertain the idea of going down to such a depth, and so he abandoned the scheme. He wanted to use electricity, as his clients were debarred from putting a steam engine on the land. He was sorry to have to abandon the idea, and it seemed to him the plant would have been very suitable for that particular case. In designing a pumping plant one engineer could never make two engines alike, as the conditions differed, and every case had to be considered on its merits. He could easily believe that the Ipswich installation was a very excellent one, although, of course, they took the risk of a rise in the price of oil. He did not know whether the author considered he had the cheapest installation in the country or not, but he (the speaker) thought he had as cheap a one as any. He had not got it, however, on the point of fuel, as he stated that fuel cost ·136d. per 1,000 gallons lifted 100 ft. He had pumped water on an actual working for twelve months at nearly half the cost of Mr. Oldham's. It would be interesting to hear the experience of the plant after two or three years' working. Where the author gained was, of course, in the low capital cost. In dealing with the cost of a pumping plant, fuel economy was one of the principal points, and the other was the interest on capital outlay. In the case of Ipswich they had a low capital outlay, and therefore the interest was low, while the fuel charges were comparatively high, and it was a case of balancing the two. The real test would be the result of the actual use of this machinery with a Diesel engine after a few years' working. With regard to the balancing of the pump, he would like to know how the very nice adjustment was made, and what would happen if the support in the pump body went away from its seating. There was no doubt that the Diesel oil engine had been much improved in recent years.

Mr. F. W. Davies (Nottingham) congratulated the author upon what he thought he might call a daring pumping plant. They had heard a great deal about these engines, but very few engineers had put them down at present, and he would be very interested to hear more about the plant after it had been running a few years. He noticed that only one engine was referred to, but that provision had been made for a second. It was usual for most engineers to put down two engines—one engine to be in duplicate with the other, or at any rate being held in reserve. He would like to know if any provision had been made for the contingency of the plant failing.

Mr. A. B. E. Blackburn (Sunderland) said it appeared to him, with a high-speed pump like the one described, there would be considerable wear and tear. Had the author taken any records of the quantity of slip on the pump? He would like to know by what method he obtained access to the pump or vertical shaft. It would be interesting also to have details of the guides for the pump rod, and to know whether the author had had any trouble with the couplings of the rods.

Mr. F. W. Hodson (Loughborough) said it seemed to him, with [illegible] ing 900 ft. [illegible], it would be dangerous to go to a much greater depth. There seemed to have been a somewhat considerable provision made for wear in the gearing top if it became necessary to put in special cooling apparatus for the oil. They were told that lubrication was by pumping through the thrust bearing and on to the gear wheels, whence it flowed back to the oil well, where it was cooled by water coils before being again pumped up. He was not quite clear as to all the details of that. The detail of the gear seemed to show ring lubrication on the main bearing of the shaft, but nothing was given of the pumping apparatus for the oil, and the cooling apparatus beyond it. He remembered hearing of the case of a gear of that nature in which the oil got so extremely hot that one could not bear one's hand on the casing. Under such circumstances it seemed to him there must be enormous wear.

Mr. H. C. Adams (London) said the pump was apparently supplied under a guaranteed fuel consumption, and after it was started the conditions were slightly varied, so that he had not been able to trace whether efficiency came up to the guaranteed figures or not. He gathered that the efficiency was a little bit on the safe side of the guaranteed figure. That led to another point, which was that the contractors were invited to tender for the type of pump they might consider suitable, and apparently there was no limit put on capital cost. They were told that the guaranteed fuel consumption of the plant adopted was one of the lowest, but seeing that with very expensive plants they could get much better efficiencies, perhaps that statement ought to be qualified.

Mr. C. H. Priestley (Cardiff) remarked that, with regard to the cost of construction of the works, the roads came out rather low, and he would also like to know what sort of cottage they could get for £250.

Mr. Davies said there was one point he omitted to touch upon. Personally, he was inclined to favour slow-running engines to fast ones; but there was no getting away from the fact that the slow-running engines had entailed great expense in the way of foundations and initial expense. He often thought, if it was his good fortune to put down another plant, he would consider putting down a slow-running engine in conjunction with a fast-running engine. Generally speaking, one was the reserve engine to the other. The fast-running engine might be reserved for emergency purposes, and although the economy might not be so great as the slow-running engine, one would be amply repaid by the lower initial costs.

Mr. Hodson asked if there was much vibration with the pump slung 100 ft. down the well.

The President (Mr. T. Molyneux) remarked that Mr. Oldham had invited them to see the plant, but it was not easy to get to Ipswich, and then down to London. At the same time, they were greatly indebted to him for the invitation.

Mr. Oldham, in reply, said he was not altogether in favour of putting the plant in, and he got it placed on record that he considered it somewhat too experimental for a public water supply. The committee, however, seeing there was a £2,000 saving on a £4,000 contract, considered they were justified in saving the town that money if they were not running too great a risk. The position of Ipswich also was that they had got another supply. At any rate, the plant was put in; it had been of very little trouble, and had worked with excellent results. He would say, in reply to Mr. Hill, that he would think electric driving was ideal for this class of borehole. He knew of a similar pump at Erith, in Kent, and there only wanted an engine-house 6 ft. square there. He could have done with a well half the size. On the question of economy, he might say that coal was dear at Ipswich, and cost him 21s. a ton. His pumping costs, with triple-expansion Worthington engines, working with coal, were 34s. per 1,000,000 gallons, with the same lift in the same reservoir, against all costs at Whitton of 25s. 7d. This was with oil £3 13s. a ton, delivered, and he hoped to get 10s. per ton off with his next purchase. Of course, there were no stand-by losses. A lot of things had to be taken into consideration with a Diesel engine, but if the efficiency was maintained, and it had been so far, then they would have to go a long way to beat it when coal cost 21s. a ton. When he was asked to contribute the paper

The Surveyor
And Municipal and County Engineer.

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he found the engines he would prefer to wait to the thing had been in working some years, but he said it would be cheaper then. He would, however, be prepared to put the engines into the pump next year, because he thought they would be good watching. There was a question raised by the weight of the pump itself being partly taken up by the pump and partly by the shaft bearing. Messrs. Sulzer, the engineers, were pioneers in centrifugal pumping working, and had improved them of late years in a wonderful way. When the pump was actually running they would notice there was just a little play in the bottom of the bearing, and it was intended to put the pump on rubber. The foundations were laid by contract, and with regard to the cottage, it was not a bad one. They would probably put in a second set after two years' working, but, as they had another pumping station, they could afford to wait. There was not the least sign of any wear to speak of, and he was not frightened at all as to that. As to slip, he had a meter on the pump which was read daily and checked, and he did not find any decrease whatever. He still averaged about 1,550 gallons a minute at a speed of 350 revolutions. One extra revolution on an engine at that speed made every difference to a centrifugal pump; but there was no sign of slip at present. With regard to getting access to the pump, there were four girders across the well, and on the bottom set of girders there was a cast-iron base, carefully bolted down and levelled, which gave access to the pump. He knew of a similar pump which had been running two years as efficiently as when it was put down. He was afraid that there would have been a certain amount of slip with such a length and such a speed, but there was not the least sign of it. The great secret was the balancing of the pump. He thought 100 ft. would be about the limit. He had had no trouble with the couplings of the spindle. The shaft was guided for 8 ft. 6 in. There was no limit to capital cost, for the committee left that entirely open. They decided to have a Diesel engine, and left it open to the pump contractors, and they had all the best pump makers entering. He would be glad to show the pump to any member who cared to visit Ipswich.

Mr. ASHTON HILL pointed out that on the question of the cheapness of the installation he agreed that it should not go out that the plant was a very economical one for fuel.

Mr. H. C. HEAD (Winchester) said the price of coal at Ipswich was 21s. a ton. What was the price in South Staffordshire?

Mr. HILL said it would be about half the Ipswich price.

Mr. F. J. DIXON (Ashton-under-Lyne) said they were putting down Diesel engines in the heart of [illegible] than Mr. Oldham's.

A member remarked that they had an engine [illegible] at Biggleswade [illegible] nomically.

[illegible] WITH THE COMBINE.

The PRESIDENT said that [illegible] the institution who are serving in the Army and Navy [illegible] the institution and the hope that the institute will be able to welcome them back at their next meeting."

Mr. A. B. E. BLACKBURN (Sunderland) seconded the [illegible]

[illegible] OF THANKS.

The PRESIDENT proposed a vote of thanks to the Geological Society for the use of the apartments, to the scrutineers of the ballot, and to the authors of the papers.

Mr. C. CHEETHAM SMITH [illegible] the motion, and it was carried.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Are we not at present suffering from rather a surfeit of science in the papers which are read before various engineering societies? Shall we be expected to make elaborate calculations to find out what is the amount of "convex contact and resistance" which we are likely to encounter when we proceed to roll a short length of road? And must we, before we proceed to build a garden wall, carefully ascertain, by costly underground experiments and most elaborate formulæ and calculations, what will be the "lateral pressure and resistance of the soil and its supporting power"? Will an engineer's life be worth living if he is to take all these scientific precautions before acting?

* * * *

Apropos of scientific discovery is the following story a true one, and did it happen before or during the present war? A certain very learned German scientist informed his War Office that he had invented a wonderful sausage on which troops could be economically and well fed. The War Office ordered a ton, and sent them to a certain general for trial and report. After about a month the general sent the War Office the following laconic report: "As an article of food the sausages are a failure, but they make excellent tent-pegs when the ground is hard." What could the Kaiser have been about?

* * * *

Was "your contributor" misled the other day when he asked "if it is a fact that the Baltic timber trade is mainly controlled by Germans"? Is it true, as subsequently conveyed by a reliable source to "your contributor," that this statement is "absolute nonsense," as there is very little, if any, German money in the trade? Cannot some of your other contributors or correspondents give us their views on this subject so as to put your contributor right if he was wrong, or confirm the suggestion if he is right? Why is it sometimes that correspondents are so backward in coming forward?

* * * *

Will not all surveyors be disappointed to hear that the Building Exhibition at Olympia will not be held this year after all on account of the war? Shall we not all miss the excellent opportunities that were given us in THE SURVEYOR Section of meeting each other and discussing professional questions, and still more the opportunity of examining the various exhibits and giving our orders in person? May we not hope that the exhibition is only postponed for one year, and that it will be held as usual in 1916?

* * * *

Will it be possible to "improve" the roads in Poland as well as those in the North of France and Flanders? Is it not proverbial that the roads in Poland are very bad at the best of times? And if this is so, can we possibly picture to ourselves their present condition? When will the military authorities decide to employ some expert civilian engineers to advise them on the repair of the roads at the Front?

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

Mr. P. T. Hargreaves, of Middleton, to whom the premium for December was awarded, has elected Prof. Jamieson's "Applied Mechanics and Mechanical Engineering," Vols. I. and II. (Griffin), and these books have been duly forwarded to him.

QUESTIONS.

This week answers are invited to the following questions:

445. Cement Testing.—Sketch and describe the apparatus necessary for conducting the bushel weight and specific gravity tests for Portland cement.

446. Materials. What is Mexican bitumen? Is it a natural product, like Trinidad Lake bitumen, or is it merely a trade term for a by-product of petroleum? If the former, what part of Mexico does it come from? (H. F. W., *Tottenham.*)

449. Roof Truss. Sketch a light iron roof truss for a span of 30 ft., and give enlarged details of the joints.

450. Masonry Dam.—The inner face of a masonry dam is a plane vertical surface 12 ft. in height. The section of the dam is a right-angled triangle, 9 ft. wide at the base, and the weight of the masonry is 125 lb. per cubic foot. When the reservoir is filled to the upper edge of the dam, find the point at which the resultant pressure intersects the base. (A.M.I.C.E.)

451. Hydraulics. Sketch a practical form of hydraulic ram for raising automatically to a considerable height a portion of any volume of water derived from a lesser height, and explain the points upon which satisfactory working depends.

REPLIES TO QUESTIONS.

447. Geodesy. Explain how the length of a measured base may be extended by triangulation. What is meant by a "base of verification"?

A measured base line may be extended by triangulation as follows. Let AB be the measured base that it is required to extend to C. Select two points, D and E, one on each side of AB, approximately at right angles to it from the point B, and each about equal to the length of AB distant from it.

FIG. 1.

In this case the length AB is known, and in the triangles ABD and ABE we get—

$$DB = \frac{AB \sin \angle DAB}{\sin \angle ADB}$$

$$\text{and } BE = \frac{AB \sin \angle BAE}{\sin \angle AEB}$$

Considering the triangle DBC we get—

$$BC = \frac{DB \sin \angle BDC}{\sin \angle DCB}$$

Again considering triangle BEC

$$BC = \frac{BE \sin \angle BEC}{\sin \angle BCE}$$

If all the measurements were absolutely correct, BC in each case would be equal. If they are not, the mean would be taken as the correct length. The above method would not be accurate enough for the main triangulation of a large survey, in

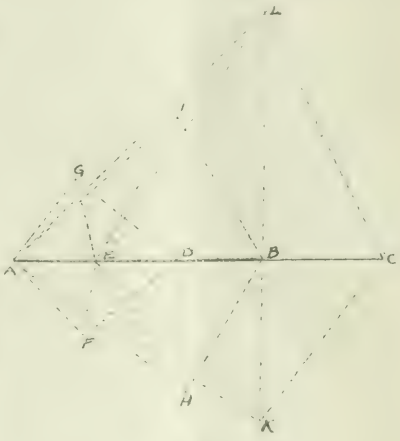

FIG. 2.

which case the line would be extended as follows: In Fig. 2, suppose AC to be the base line, of which AB has been measured, the points E and D having been fixed during the measurement. Select stations F and G so that the angles at E may be nearly right angles and the points themselves nearly equidistant from the line, and about equal to AE. The points H, I, K, L are similarly determined. Set up a theodolite at each of the stations and observe all angles. The length of BC can now be calculated as follows: (1) From AE and the observed angles calculate the length of EF and EG. (2) Calculate the length ED by means of triangles EDG and EDF, thus checking the length of ED as measured. (3) Calculate DB and DI in similar manner, using AD and ED as bases. (4) Calculate DK and DL, and again this checks the length as measured. (5) The length of BL and BK are next calculated, using AB and EB as bases. (6) Should the length of [illegible] taken from which the length BC is calculated, thus giving the required addition to the base line. A [illegible] of a triangle at a distant part of a survey that is measured in a similar manner to the original base from which the calculations were made. It is used to verify the accuracy of the calculations, and is probably the most severe test that can be applied to a [illegible] J. A. R., *Faversham.*)

Earthworks.

By G. BERTRAM HARTREE, F.S.I., Engineer and Surveyor to the Alton, Hants, Urban District Council.

It is not proposed in this article to attempt to teach the principles of defence or offence. It is presumed that the municipal surveyor may be called upon to carry out entrenching or similar work, for the military authorities, and the object of the contribution is to assist him in such work in the absence of detailed instructions from his military chiefs.

To the civilian mind the principles of fortification

Section.

Fig. 1.

may be likened to the snow enthusiast on snowballing. His first urge is to oppose his enemy on the spot, but later, more especially if he encounters a force of superior strength, a form of entrenchment appeals to him, and he finds a suitable wall from the shelter of which he can deliver a vigorous surprise attack, and at the same time have protection from the enemy's volleys. In the absence of a wall, he may

Fig. 2.

find a hedge or ditch that will give him sufficient screen, failing which, he can be imagined to have excavated a trench in the snow. We may take the alternatives: (*a*) His enemy knows his whereabouts and intends to attack him, (*b*) his foe may be unaware of his presence, but he is fully aware of the course the opponent will take. In the former event, nothing is to be gained by the lack of concealment being visible is no so great an objection, but in the latter case secrecy from view helps his attack considerably. In either event a ring of pitfalls will impede, if not actually prevent, his being borne down by superior numbers. To the methodical snowballer the possibility of flank and rear attacks will occur, and utilising boys' play to illustrate warfare, two other important factors in war must be included: (1) A well-aimed bullet would settle one opponent, and a secret shelter aids this considerably. (2) Artillery on the enemy's side will demolish the defenders' banks, and, if not killing him by shot or shrapnel, may [illegible]

Consequently it appears that in actual fight the soldier requires a screen from which he can deliver a [illegible] time will protect him from return attack. Assuming a soldier in the open, his only means of concealment [illegible] mound, instead of partial, he obtains nearer total [illegible] of a pick and shovel, he could in ten minutes construct an effective substitute, as shown in plan and section (Fig. 1), which illustrate a pit 6 ft. in length, 9 in. in depth, and 2 ft. 3 in. in width, with a further extension to the left to screen the legs, which, with a right-handed man, would lie in this direction. The excavated earth forms two adjoining mounds that leave a depression on which the rifle will rest.

Given sufficient time, more convenient and better [illegible] pits could be [illegible] as required. Fig. 2 illustrates the development of a small pit into one

Fig. 3.

larger and better protected. The space marked C is 2 ft. 6 in. in width, the same in length, and 18 in. in depth. With its excavated earth as shown shaded, cover would be provided for a man kneeling. As opportunity and time permitted the pit could be further developed as follows:—

Standing pit, 3 ft. deep, excavate E; for seat, excavate B. Standing room at rear, and kneeling space near mound, excavate A, B and D. The time taken in this work is governed by the nature of the soil, but an average may be taken as a half-hour for each quarter section measuring 2 ft. 6 in. by 2 ft. 6 in. by 1 ft. 6 in. Further protection may be obtained by loopholing, as shown in Fig. 3.

If available, logs, blocks, bricks, and so forth, would be useful for this work. Owing probably to the compact manner in which they can be transported, the military forces generally use bags which are filled with

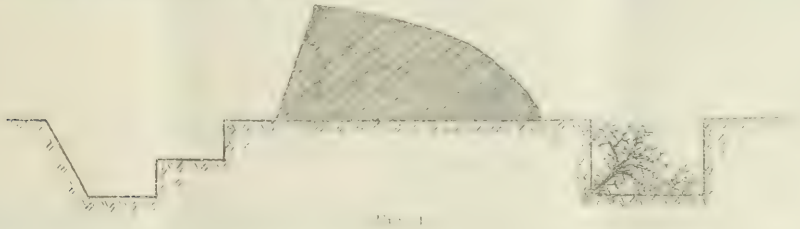

Fig. 4.

earth, and are more commonly known as sandbags. Two are laid longitudinally, with a space between for the rifle, and two laid transversely, with the earth above to give head cover.

By additional labour, adjoining pits can be connected up as trenches, and by further protection and improvements a breastwork, as shown in Fig. 4, will be developed. This is extended by throwing the mound forward, cutting a ditch on the enemy's side

That shown on sketch is 4 ft. 6in. in width and 3 ft. 6 in. in depth.

By the judicious use of thorns, bushes or spikes, preparations can be made so that, in the event of the enemy occupying the ditch, his stay would not be pleasant. The mound in sketch is 4 ft. 6 in. in height, with a batter of 1 ft. 6 in., and a total base about 9 ft. Behind is standing room 2 ft. 6 in. wide, with two 18-in. drops, and further widths of 2 ft. 6 in., and a batter of 18 in. at the rear.

During the present war the practice of making mounds in front of the entrenchments appears to have been discontinued, and it occurs to the civilian mind that the principal reasons for this must be necessity for concealment, with a reduced mark for

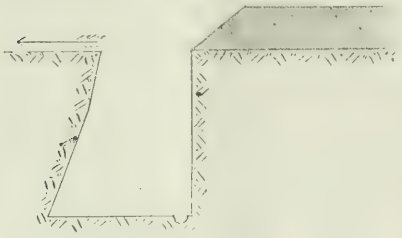

Fig. 5.

the enemy's fire. For better protection the trenches are tunnelled under wherever possible. Of course, the nature of the soil as to hardness, compact character, or otherwise, is of importance. All excavated earth is dressed down behind the trench to give from the enemy's side as little view as possible, and following two principles—shelter and concealment.

Fig. 5 shows a suggested type for a compact earth. Fig. 6 is an alternative arrangement, the choice, of course, probably being governed by local geological conditions. Fig. 7 shows the presumption that an existing hedge and ditch have been adopted as a shelter, and subsequently developed, and here there is the

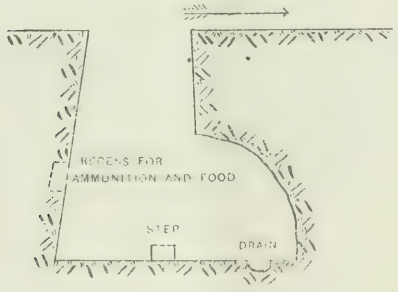

Fig. 6.

advantage that the newly turned earth is screened from the enemy's view. Fig. 8 is a suggestion, assuming the earth is of unstable nature, incapable of being undercut. Several military friends, however, tell me that, while the principle has much to recommend it, the main difficulty is the obtaining of the necessary timbers, and consequently it can be taken only on the presumption that such are at hand—and in such event, to the engineer actively engaged in sewer construction, many alternate and improved designs will occur.

Modern experience has proved the necessity of avoiding straight lines for trenches and adopting, according to topographical and other requirements, zig-zag, chevron-shaped, or a series of angles in planning trenches as shown in Fig. 9; in addition, the width is reduced so as to allow only of a man passing along, and insufficient to permit his passing another, except possibly at specially prepared points. Presumably the objection to straight and wide trenches is the fact that an enemy, by an enfilade movement, might sweep the whole of the defenders with a machine gun.

Where the configuration of ground does not permit natural cover for infantry in reserve, special shelters should be provided. Fig. 10 shows a simple form of shelter made by excavating and roofing over, either with close rows of timbers, spaced timbers with transverse rows of corrugated iron, hurdles, or any other material at hand, the whole being well covered by earth, finished off to present the smallest possible mark to the enemy. For covering guns, there are the alternatives of—(1) Constructing an epaulment or (2) sinking a gun-pit; local conditions decide which. If some form of natural shelter can be adapted, the former would probably be preferred, as, while the work of construction is in hand, the gun, if required, could be in its intended position and put into action; and there would probably be a further advantage in utilising an existing wall or bank, and so leaving the finished epaulment indistinguishable from the existing bank. With soft soil and no natural shelter, a pit would be provided, but in such case there would be no shelter whatever for the gun until the pit was finally completed.

Fig. 11 shows a typical plan that might be adopted for either. Of course, it is highly probable that local conditions and military necessities would require modification. The gun pit, as shown in the plan and section, could be constructed by five men in from one to two hours, according to the nature of the

Fig. 7.

ground. If available, a flooring of sleepers, laid transversely, would be very useful; failing which, flints would be of advantage.

Should the municipal engineer by any chance be left to his own initiative, the following points are recommended as worthy of consideration:—

(1) Arrange that your earthworks are in a position to make possible a sweeping fire, from which there is no natural protection, such as trees, hollows, or land configuration. (2) Avoid anything in the nature of a landmark, such as positions on the skyline, and works that give a different colouration to the surrounding ground surface. For example, on a brown-coloured soil, with a chalk subsoil, a very definite mark would be presented were the chalk exposed to

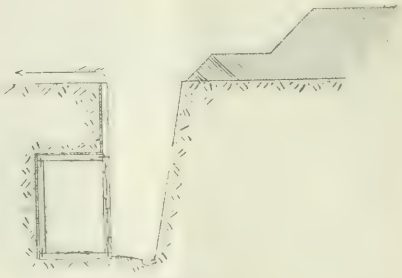

Fig. 8.

the surface. (3) Arrange for drainage of trenches. (4) Sand and light earths are better defence than plastic clays or hard earths. (5) Do not construct trenches immediately in front of elevations, particularly if of hard character. A sandbank would absorb bullets, and with a good batter might have no other objection; but a wall or hard rock is dangerous, as upon being struck by a shrapnel shell the contents of the latter would discharge on the rear of the defenders.

By use of obstacles, the defence can be greatly increased, and it is, of course, an advantage to use obstacles of such character that their removal by

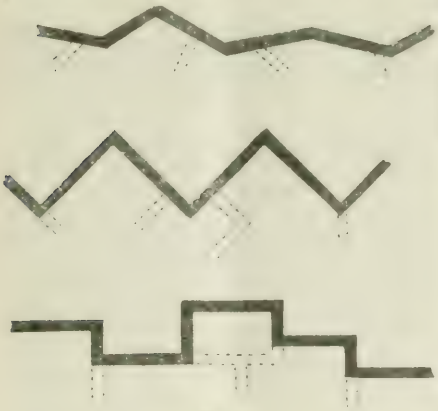

FIG 9.

Among obstacles mentioned in military manuals are [illegible] consisting of stakes pointed and driven [illegible] This is about the height of a man's knee, and as near [illegible] slope towards the attackers is made, and covered [illegible]

Ditches, if dug as obstacles, should be planned to prevent their adoption as trenches by the enemy, [illegible] the defenders' fire. Pointed brushwood or palisades [illegible]

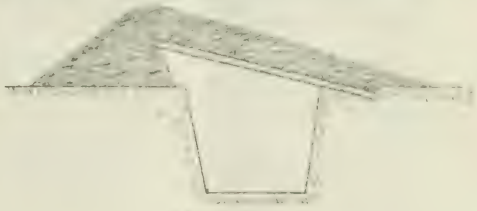

FIG 10.

latter the pointed form of galvanised iron sheeting [illegible] patterns, with any suitable tool, the edge of the plain form can be improved.

Screening is an important point in connection with this subject; but when endeavouring to conceal works care must be taken to avoid anything appearing unnatural and to expose the defence. [illegible] careful work was detected by the cut ends of the wood showing white. Had these been smeared with

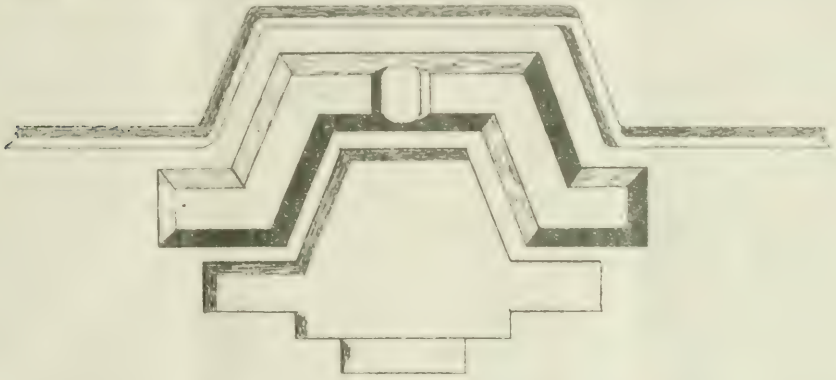

FIG. 11.

wires are attached, and run longitudinally, transversely and diagonally. The type more difficult to negotiate consists of posts the tops of which are breast high. The wires are taken from base of posts to the tops of those adjoining, and the whole arranged so that the attackers have the greatest difficulty in passing through, and at the same time are open to the fire of the defenders. Of course, barbed wire is the most suitable material for making [illegible] with the whole would have appeared to [illegible] impossible could be expected.

Waste Heat Boilers and Water Heaters.—All users of gas engines, oil engines and furnaces will be interested in a pamphlet just issued by the Bonecourt Waste Heat Boiler Company, Limited, Parliament Mansions, Victoria-street, S.W. The subject of the utilisation of the waste heat of the exhaust gases of

FIG. 12.

obstacles. Substitutes for the foregoing include pickets with sharp tops, brushwood or thorns, fixed with points towards the enemy.

The daily papers recently illustrated a further development of the pointed picket as used by the Austrians. These were fixed in small holes planned in lozenge shape, and further made difficult by the entanglements of wire on the surface.

In order further to screen such entanglements from the attackers, a glacis is erected on the enemy's side, from the earth that is thrown out of the holes.

internal combustion engines and industrial furnaces is one in which this firm have specialised, and they have designs of steam boilers and water heaters to meet the many different conditions of actual service. The space occupied by the Bonecourt Patent Waste Heat Boiler or Water Heater is extraordinarily small for the output, and to those of our readers who desire to obtain additional steam power, or a continuous supply of low-pressure steam or hot water without extra cost for fuel or attendance, we commend the pamphlet above referred to.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 57 Moorgate-street, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

WATER SUPPLY: "TRADE PURPOSES": RESTAURANT.—An important question under the Metropolitan Water Board (Charges) Act, 1907, was decided in *Oddenino* v. *Metropolitan Water Board* (Chancery Division, Mr. Justice Sargant, October 16th). The point in dispute was whether the plaintiff was entitled to a supply of water for domestic purposes at his restaurant in Regent-street at the domestic rate. The board relied on sec. 20 of the Act, which provides that they are not "bound to afford a supply of water otherwise than by measure to any house or building whereof any part is used for any trade or manufacturing purpose." On behalf of the plaintiff it was contended that the words "trade or manufacturing purpose" in this section should be construed in the same way as the courts had construed the words "any trade, manufacture, or business" in sec. 25. The last-mentioned section provides that the expression "domestic purposes" shall not include *inter alia* "any trade, manufacture, or business." In *Metropolitan Board* v. *Avery* (1914, A. C., 113) it was held that the test to be applied was not whether the water was consumed in the course of the trade, but whether the user of the water was in its nature domestic. Mr. Justice Sargant, however, after considering the relevant sections of the Act, came to the conclusion that sec. 20 was not governed by the above-mentioned case and other decisions given under sec. 25. He thought the test indicated by the words of sec. 20 was addressed to the character of the house, and not to the purposes to which the water was put. He therefore held that the board were not bound to give a supply to the plaintiff at his restaurant otherwise than by measure.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as XYZ, and words such as "engineer" and "surveyor," should never be used.

HIGHWAY ACTS: OBLIGATION OF ADJOINING OWNERS TO CROSS FOOTWAY.—"Gordon" writes: Has the owner of premises adjoining a public street the right to drive over a flag footpath without putting down a crossing? The proprietors of a local garage are utilising some adjoining premises for storing cars, and these are constantly passing and repassing over the footpath. I have asked them to put down a crossing, but they demur to do so. I cannot say that as yet they have broken any flags, but, of course this is quite possible and probable. To prevent the sudden jar at the edging they lay down a piece of wood in the channel. I am aware of Clause No. 18, Public Health Acts, Amendment Act of 1907, but I do not think this is compulsory upon the owner or tenant. I wish to know whether the authority can insist upon a crossing being laid down by the owner or tenant, or whether they can stop him going over the footpath, or generally what can be done in the matter.

The owner of premises adjoining a highway is entitled to cross to the highway at any point where his premises are in contact with it. In *Lyon* v. *St. Mary, Newington*, 1 Q.B.D., L.R., 5 Q.B., the vestry refused to allow the owner of a yard to make a crossing over the footway for carts, machinery, and from his premises. He therefore carted it across the footway in waggons, with the result that the pavement was smashed. It was held that he was *not* liable for wilful injury to the highway under sec. 72 of the Highway Act 1835. In the present case the positions are reversed, the council wanting a crossing and the owners refusing to make one. Although the owners cannot be compelled to put down a crossing if the council are willing to allow them to do so on reasonable conditions, and they refuse, they would probably be held liable for any injury they may cause to the footpath. Sec. 18 of the Act of 1907 is only in force in districts in which it is applied by the Local Government Board. In the opinion of the learned editors of "Lumley's Public Health Acts," the meaning of the section is not clear, and on its being applied in a district the question will arise whether it limits the owners' right of access.

ROAD REPAIR AGREEMENT.—"Anxious" writes: A road which has been repaired by the landowners here for the past five or six years has been attended to by my rural council, and put into a passable condition at the request of the agent to the landowner. While no money was contributed by the landlord towards putting the road into a safe condition, they promised my council to give from an adjacent quarry sufficient stone and gravel to pay for the cost that the council had gone to, but they still owe my council over £100 worth of stone, which cannot, however, be got as the quarry is almost worked out. An agreement was drawn up and duly signed by both parties (the council and the landlord) respecting the stone. Are my council in the position of giving up attending to the required repairs of this road, and the several fence stone walls that are now in need of repairs, through the arrangements come to, and through the past years' attention by the council's men, as the road was not taken over in the proper legal way?

It is impossible to answer this query without seeing the agreement or a true copy thereof. Sec. 148 of the Public Health Act, 1875, empowers an urban authority, by agreement with any person liable to repair any street or road, to take on themselves the maintenance, repair, cleansing or watering of any such street or road. It has been decided that this section enables an authority to agree with a person who is liable, *ratione tenura*, that, in consideration of a money payment, the authority shall take over in perpetuity the liability for such repair (*In re Earl of Stamford and Warrington, Ingram* v. *Gray* [No. 2], 1911, 1 Ch., 648). It seems clear therefore that under this section an urban authority may agree to take upon itself for ever the entire maintenance and repair of a *private* road without the formalities prescribed by the Highway Acts. Whether in the present case the agreement entered into has this effect, in view of the fact that the landowners have not carried out their part of the compact, is a question that must depend upon the terms of the document itself and its interpretation.

WATER-RATE: REDUCTION OF RATEABLE VALUE.—"O" writes: I shall be glad if you will give me a word of advice as to dealing with similar cases to the one specified below. A property is reduced in rateable value, and the altered assessment signed by the overseers in August, application having been made therefor in the April previous. The tenant of the property now claims a rebate from the water-rent for the half-year ended June 24th, and in addition declines to pay on the old assessment for the quarter ended September 29th. The local Act distinctly states that the rateable value in such premises as aforesaid shall be ascertained by the valuation list in force at the commencement of the quarter for which the rate accrues; if there is no such list in force, by the last rate made for the relief of the poor. My contention is that the consumer on the premises in question is liable to pay water-rate on the old assessment up to the end of the next succeeding quarter after the date of the altered assessment.

Assuming that the old Valuation List was in force on June 24th, the rateable value would, according to the local Act, be ascertained by that list for the quarter commencing on that date, as well as for previous quarters. Consequently the consumer would be liable to pay on the old assessment up to September 29th.

TENDERS FOR CONTRACT.—"Tender" writes: Tenders are invited by advertisement for the execution of a contract. Forms of tender, specification and quantities are supplied to persons tendering on payment of a deposit. When the tenders are sent in none of them is accepted, but the work is carried out by employed labour. The deposit was returned on the receipt of tender. Can those who submitted tenders claim the return of the tender and the priced quantities sent in, or either of them?

In my opinion a contractor who sends in a tender for the execution of works is not entitled to claim the return of the tender or of the priced quantities in the event of the tender not being accepted.

We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Beckenham U.D.C. (December 22nd. Mr. M. K. Nurse.)—£2,50[illegible] for the erection and equipment of [illegible] and Upper Elmers End Road. Also for the construction of the Crescent and Cromwell Avenue, and of private street improvements in St. [illegible] and the [illegible] of the cost thereof from frontagers and to Parliament. Details of the proposals were explained by the surveyor, Mr. J. A. Argent, who also produced and explained the plans on a model to the inquiry.

Burton T.C. (January 4th. Mr. E. G. Hobhouse.)—£30,000 for the [illegible] with the existing [illegible] Mr. J. B. Chapman acted for the [illegible] Mr. [illegible] explained the scheme and [illegible] time of the [illegible] the [illegible] the [illegible] the [illegible] without stopping [illegible] the [illegible] [illegible] [illegible]

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Bristol £7,704, Leeds £23,000, Newport £80,000; housing and town planning—Chester-le-Street, roads and materials—Birmingham, Easington, Wheadon; sewerage and sewage disposal—Irlam £16,000, Liverpool £31,000; water, gas and electricity—Birmingham.—Particulars of other projected works will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Bristol T.C.—The council on Friday last agreed to a scheme for the extension of the infectious diseases hospital, at an estimated cost of £7,704.

Chard T.C.—The borough surveyor, Mr. E. W. Hearn, has been instructed to prepare plans for carrying out such portion of the scheme for the alteration and improvement of the municipal buildings as will cover the present necessary repairs, including the erection of new stage and dressing-rooms.

Halifax T.C.—The Markets Committee advise the corporation to purchase property in Market Hall-street, at a cost of £2,265, for the extension of the slaughter-houses.

Hexham R.D.C.—It has been resolved to proceed with a scheme for the erection of a hospital, at an estimated cost of £2,000. It was reported that a good supply of water could be obtained in the vicinity of the proposed building. A borehole had been put down on the site, and had yielded 360 gallons per hour. A sample of it had been analysed by Messrs. Bell & Riddle, and found very satisfactory.

Leeds T.C.—The Improvements Committee recommend that an arrangement be made with the Midland Railway Company whereby the corporation will pay to the company a sum not exceeding £7,200 towards the cost of the reconstruction and maintenance of the company's bridges over Wellington-road and Geldard-road in consideration of the company dedicating for street widening an approximate area of 149 sq. yds. of land, and reconstructing the bridges in such a manner as to permit of the widening of Wellington-road to 56 ft. and Geldard-road to 54 ft. 4 in. The council will also be asked to authorise the expenditure of £308 on carrying out street works in connection with the widening.

Leeds T.C.—A recommendation is made by the committee concerned for the extension of the meat market and slaughter-houses at Kirkgate, at an estimated cost of £23,000.

Malton U.D.C.—It was reported last week that the Pickering Urban and the Malton, Pickering, Helmsley, Kirbymoorside and Easingwold Rural Councils had agreed to combine with this council in providing an isolation hospital.

Manchester T.C.—The City Council on Wednesday approved the proceedings of a special sub-committee recommending the purchase of a plot of land at Chorlton-cum-Hardy for the erection thereon of public baths.

Newcastle-upon-Tyne T.C.—The extension of the infectious diseases hospital is under consideration.

Newport (Mon.) T.C.—The Parliamentary and [illegible] bridge should be built of ferro-concrete. The proposed structure will have a width of 70 ft. in three [illegible]

HOUSING AND TOWN PLANNING.

Chester-le-Street R.D.C.—The Local Government Board have sanctioned the necessary loan for the Harraton housing scheme, and tenders are to be obtained forthwith for the work.

Dublin T.C.—The City Housing Committee recommend the [illegible] Field," and the erection thereon of thirty houses.

Ormskirk U.D.C.—The surveyor, Mr. H. W. Chadwick, has prepared plans for working-class houses.

Pontypridd U.D.C.—For the purpose of a housing scheme it has been agreed to lease a site at Rhydfelin, opposite the houses already erected by the council, at 1½d. per square yard; also land at Fairfield, subject to the price being the same. The number of houses to be erected will be decided later.

Trim R.D.C.—At a recent meeting of the council a resolution was passed to adopt the Labourers' (Housing) Act, and to rescind the resolution to the contrary.

Wincanton R.D.C.—Official sanction has been given to the housing scheme for Bruton.

PARKS AND OPEN SPACES.

Birkenhead T.C. The town council are recommended by the Health Committee to purchase land at Rock Ferry, at a cost of £1,408, for a recreation ground.

Erith U.D.C.—The surveyor, Mr. H. Hind, has been instructed to prepare plans for two tennis courts in the recreation ground.

REFUSE COLLECTION AND DISPOSAL.

Godstone R.D.C.—The recommendation of the Highways Committee to purchase six carts for scavenging purposes has been agreed to.

ROADS AND MATERIALS.

Andover R.D.C.—The surveyor, Mr. J. Wormald, has received instructions to repair certain roads near Tidworth upon the requisition of the military authorities, who will bear the cost.

Axholme R.D.C.—The proposal to widen the roads of only 9 ft. or 10 ft. wide throughout the district came before the council at a recent meeting. The surveyor, Mr. B. West, presented a list of these roads, and said he estimated that the cost of adding 3 ft. to the width, where practicable, would be about £120 per mile. Of equal importance would be the alteration of some of the narrow right-angle, and often "blind," corners, which existed on several of the through roads in the district. It was agreed to consider the matter further a month before the meeting at which the yearly estimates will be submitted.

Birmingham T.C.—The council on Tuesday passed a resolution authorising the Tramways Committee to purchase lands on the Bristol-road tramway route, at an estimated cost of £41,958, for the purpose of widenings. The Finance Committee were also authorised, subject to the approval of the Board of Trade, to borrow £42,000, the balance of the cost of constructing the tramway in Pershore-road as a double line, after providing £26,000 from the tramways reserve fund.

Bognor U.D.C.—A scheme for the widening of the marine road west of the pier is to be carried out under the auspices of the Central (Unemployed) Body, at an estimated cost of £9,000.

Broadstairs U.D.C.—The surveyor, Mr. H. Hurd, has received instructions to report as to the advisability of carrying out repairs in Kingsgate-avenue.

Derby T.C.—It is proposed to purchase property in Cheapside, at a cost of £4,300, for the purpose of an improvement scheme.

Dudley T.C.—The Public Works Committee, in a report issued last week, state that, having given further consideration to the proposals for the construction of a new road between Wolverhampton and Birmingham, they recommend that, as the scheme would not in any way benefit the town of Dudley, the Association of Midland Local Authorities be informed that the council did not support it.

Earby U.D.C.—The West Riding County Council have intimated to the urban council that they will bear the cost of the proposed main road improvement at Wysick Hill bottom.

Easington R.D.C.—The council have agreed to increase to £20,000 their contribution towards the cost of the proposed coast road, on the condition that the Road Board makes a contribution of £30,000. It is understood that the other authorities concerned, the county council and the West Hartlepool Corporation, will also contribute £20,000 each.

Godstone R.D.C.—The tender of the Taroads Syndicate has been accepted for tar-washing the roads in the ensuing year.

Halifax T.C.—Widening schemes at Bull Green and King Cross-street are to be carried out under the

direction of the borough engineer, Mr. J. Lord, at an estimated cost of £3,200.

Hendon U.D.C.—The council have approved the estimate of the surveyor, Mr. S. S. Grimley, at £1,704 for making up Lovelace Place.

Ilford U.D.C.—It has been decided to make up Uphall road under the Private Street Works Act.

Lancaster T.C.—Plans have been passed for making up Church avenue and Chatsworth road.

Leicester T.C.—The council on Tuesday voted a contribution of £400 to a fund for the improvement of Victoria Park, as a thanksgiving for the conclusion of peace. (See Barrow Rural District Council).

Moira R.D.C.—The council have approved the proposals of the county surveyor, Mr. James Heron, for doing the road work by direct labour. The estimated yearly saving under the scheme is £252. The wages of the surfacemen are to be raised from 12s. to 14s. a week.

Romford R.D.C.—The tender of Mr. F. W. Moss, Romford, at £2,256, has been accepted for new street works.

Somerset C.C.—Negotiations are in progress in regard to the land required for the proposed widening of Bristol Hill, Bridgwater.

Willesden U.D.C.—Certain road widenings and works of sewerage, estimated to cost £7,000, have been approved by the council.

SEWERAGE AND SEWAGE DISPOSAL.

Alcester R.D.C.—A scheme is under consideration for sewerage works at Great Alne, which are estimated to cost £300.

Berkhampstead R.D.C.—A sewage disposal scheme is to be carried out at Long Marston, at an estimated cost of £300.

Godstone R.D.C.—The tender of Messrs. Head Bros., at £94, has been accepted for the construction of a sewer at the outfall works.

Guiseley U.D.C.—The West Riding Rivers Board have written to the urban council giving two months' notice of their intention to take proceedings against them in respect of a stream contaminated in places by sewage.

Irlam U.D.C.—It has been resolved to carry out extensions at the sewage disposal works at an estimated cost of £10,000.

Liverpool T.C.—It has been decided to construct a new main sewer across the dock estate at an estimated cost of £31,000.

Manchester T.C.—After an inspection of the completed work of a section of the main drainage scheme begun three years ago, a meeting was held of the Rivers Committee and members of the Withington Committee at which speeches were made with respect to the sewerage of the city. The chairman of the Rivers Committee, Mr. Froude, said it was three years ago last month that the committee got the approval of Parliament to make these new sewers. They had since done a magnificent work, a work which would help to make Manchester one of the best-drained and healthiest cities in the world. The total length of sewers finished amounted to about 17 miles, and the total amount of contracts let to date was about £614,000. The size of the sewers varied in diameter from 15 ft. 3 in. to 2 ft. 6 in. Mr. Froude complimented the contractors (Messrs. Griffiths & Co., Westminster) upon the excellence of their work; he had never seen a better piece of work than that which the committee had been inspecting. As for the city surveyor (Mr. T. de Courcy Meade), it was a monument to him that would do him credit among generations yet to come. Councillor West (deputy chairman) said the city surveyor had always advised the committee to have only the best materials, and they had always supported Mr. Meade in that matter. The cost of the section of the work inspected was £48,399.

Nottingham T.C.—The Health Committee report that the work of converting pail-closets into water-closets had been carried out continuously since the council had given authority for inclusion in the committee's estimates of an annual sum to enable them to subsidise owners who voluntarily carried out the conversions. In addition to pail-closets, however, there are a considerable number of waste-water closets in the city which were constructed some years since as a half-way step between pail-closets and water-closets. Such closets, although then considered an improvement on pail-closets, have never been satisfactory, and often get out of order and become very insanitary, resulting in much trouble and nuisance. The committee recommend that the council should authorise them to pay to owners of all waste-water closets who voluntarily convert them into water-closets a similar subsidy to that paid in respect of the conversion of pail-closets.

Paignton U.D.C.—The tender of Mr. A. E. Brock, at £512, has been accepted for sewerage works.

Trowbridge U.D.C.—The surveyor, Mr. H. Lailey, recently submitted to the Building and Sewage Disposal Committee a new type of pipe joint which he had designed, and which he considered would be advantageous for sludge and sludge-water drains, inasmuch as if the drains were required to be diverted or moved at any time the diversion or removal could be accomplished without damage to any of the pipes. The committee inspected samples of the pipes, and were of opinion that the use of them would be a great advantage in carrying out the work and an improvement upon the pipes originally specified. They therefore authorised the use of this special type of pipe for the purpose, the surveyor having offered his design free, without any royalty or benefit to himself, direct or indirect. The action of the committee was confirmed by the council.

Wakefield R.D.C.—Drainage works estimated to cost £220 have been approved.

WATER, GAS, AND ELECTRICITY.

Ballymena U.D.C.—The council have adopted a scheme prepared by Messrs. Sawley & Corrance, of Belfast, for a new water main from Queen Street, recommend that the pipe should be an 8-in. one instead of 7-in., as proposed.

Belper R.D.C.—The surveyor, Mr. R. C. Cordon, has in hand a scheme for water supply for Alfreton, which will probably be submitted to the next meeting of the council.

Birmingham T.C.—The council on Tuesday last authorised the Baths and Electric Supply Committee to proceed with the erection and equipment of a temporary electric supply station at Nechells, at an estimated cost of £97,300, for the purpose of supplying a large new demand, including a certain proportion created by the Government's requirements [illegible]

Castletown R.D.C.—The council have adopted a scheme for the improvement of the water supply, at an estimated cost of £1,200.

Paul (Cornwall) U.D.C.—Consideration is being given to alternative schemes for an improved water supply.

Wellington U.D.C.—The engineer and surveyor, Mr. G. Riley, has received instructions to prepare plans and specifications for sinking a second borehole, with a view to obtaining an additional supply of water.

Ystradgynlais R.D.C.—The council have agreed to purchase the Glantawe electric supply works for the sum of £17,000.

MISCELLANEOUS.

Trowbridge U.D.C.—The chairman, the Rev. H. Sanders, at the recent council meeting, said that some little time ago, when it was decided to put the troops into disused factories, their surveyor, Mr. H. Lailey, was asked if he would be good enough to prepare plans to help the work forward, which he did, to the satisfaction of the military authorities. The cheque paid for the plans Mr. Lailey had handed to him, telling him he might do as he liked with it. He could assure him that it should be put to some useful purpose—not for himself. They were very much obliged for the gift.

Twickenham U.D.C.—It has been decided to purchase for £118 a second-hand dumb barge fitted up for the use of bathers of both sexes at all times of the day, subject to their wearing regulation bathing costumes.

Society of Architects.—The annual meeting of this society will be held on Thursday next at 7.30 p.m.

Waterproofing of Cement.—We understand that, in the specification for the Bilton schools, the use of Pudlo has been specified for impregnating the cement.

Water Supply at Wath-upon-Dearne.—The extensions of the Wath-upon-Dearne waterworks have been completed at a cost of £12,000. The scheme, by which the capacity of the reservoirs has been increased to 900,000 gallons, was carried out under the direction of the surveyor, Mr. J. H. Drew.

PERSONAL.

Mr. Thomas Colbert, Dunbar, has been appointed burgh surveyor of Oban.

Mr. Swarbrick, deputy borough surveyor of Swansea, has been voted £100 for extra services.

Mr. John Robertson, surveyor to the Darlington Rural District Council, has resigned his appointment, after a service extending over nineteen years.

Mr. J. Thorpe, surveyor to the Market Bosworth Rural District Council, has been appointed temporary assistant to the Ashby Rural District Council.

Mr. A. H. Waller, formerly deputy town engineer of Durban, has been appointed to the post of town engineer of Bulawayo for a period of twelve months, subject to three months' notice. The salary is £800 a year. Mr. Waller assumed his new duties on the 16th ult.

Mr. Thomas Colbert, road surveyor for the Western District of the county of Haddington, died, we regret to state, on Friday after a brief illness. A little over thirty years ago Mr. Callen was appointed assistant surveyor for East Lothian, under the late Mr. John Nelson. On the latter's death Mr. Callen was given full charge of the Western District roads.

Mr. T. W. M'Cullough, chief waterworks engineer of the city of Belfast, was unanimously elected president of the Institution of Water Engineers for the year 1915-16 at the winter meeting of that body held in the Geological Society's Rooms, Piccadilly, London, on Friday, the 11th ult. The new president is a native of Belfast, and has had a long and extensive practice as a waterworks engineer in nearly every province in Ireland, having been concerned in the design and construction of many provincial waterworks undertakings, but more particularly responsible for the design and construction of the several extensive reservoirs, filters, conduits, tunnels, and the other contingent works in connection with the water supply for Belfast, where, for the past eighteen years, he has been the chief waterworks engineer, and is now engaged in the preparation of the contract plans and specifications for the immediate construction of the extensive "Silent Valley" storage reservoir, to hold 3,000 million gallons, in the Mourne Mountains, some 45 miles due south of the city. In earlier years he was also responsible for the design and construction of several sewerage, harbour and railway undertakings in Ireland, and is the author of the first scheme for an Irish Channel tunnel, between the Co. Antrim coast in Ireland and the Wigtownshire coast in Scotland. He has been a member of the Institution of Water Engineers since its formation and was elected in 1889 a corporate member of the Institution of Civil Engineers, and for several years past has been a Justice of the Peace for the city of Belfast.

The late Mr. William B. Bryan, M.INST.C.E., chief engineer to the Metropolitan Water Board, left property valued at £49,873.

CORRESPONDENCE.

[illegible]

PROFESSIONAL MEN AND THE WAR.

To the Editors of THE SURVEYOR.

Sir,—I should be glad if you would kindly allow me space in your paper to bring to the notice of your readers the [illegible] of the Technical Civil Service Bureau.

Since the war started we have successfully worked [illegible] the Royal Engineers, and Army Service Corps, and the "Artists."

We are now in a position to advise men about all branches of the Service, and to help them to enlist where they would be most useful.

Skilled men [illegible] are urgently required at Headquarters, and I shall be glad to advise all applicants if they will communicate with me, or call at 18 Tufton-street, S.W.—Yours, &c.,

ALAN PATRIC,
Hon. Recruiting Officer.

18 Tufton-street, Westminster, S.W.
January 1, 1915.

PRO PATRIA.

[SEVENTEENTH LIST.]

We present herewith the seventeenth list of municipal engineering and sanitary officials who are taking part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

Cole, A. V., engineering assistant, Nelson Corporation, R.A.M.C.

Crowther, A. H., junior clerk, borough surveyor's department, Nelson, R.A.M.C.

Holt, J. [illegible], pupil, borough surveyor's department, Nelson, R.A.M.C.

Smethurst, E. S., architectural assistant, Nelson Corporation, R.A.M.C.

From the various departments of the Salford Corporation 708 men have joined the military and 15 men the naval forces since the war began.

The Cardiff city engineer's office staff and workmen, as a result of their weekly collections, contributed £11 12s. 3d. to the Prince of Wales' Fund during the months of November and December. The amount previously contributed was £124 3s. 10d., making a total up to the end of the year of £240 16s. 1d.

FOR OTHER ADVERTISEMENTS

See End of Paper.

CAERPHILLY URBAN DISTRICT COUNCIL.

SURVEYOR'S ASSISTANT.

Applications are invited for the appointment of Assistant in the Surveyor's Department of the above Council.

Applicants must be good draughtsmen, and accurate surveyors and levellers, experienced in Private Street Works and the general routine of a Surveyor's Department of an Urban District Council. Architectural experience will be considered a qualification.

Salary £80 per annum, rising by annual increments of £5 to £100 per annum.

Applications, stating age and qualifications, accompanied by copies of three recent testimonials, and endorsed "Surveyor's Assistant," must be addressed to the Chairman of the Finance Committee, and delivered at the Council Offices, Caerphilly, not later than Monday, 18th January, 1915.

(By order)
ALFRED O. HARPUR,
Surveyor.

(2,233)

AN ARCHITECTURAL DRAUGHTSMAN required (near London), temporarily.—Apply, [illegible] qualifications, to Box 1,501, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,238)

BECKENHAM URBAN DISTRICT COUNCIL.

TO CONTRACTORS.

The Beckenham Urban District Council invite Tenders for the [illegible] of stream between Croham-road and Harper's Roads, and also the reconstruction of a culvert under Cedars Road.

The works include some 270 cub. yds. of cement concrete, and 400 cub. yds. of excavation.

Plans and Sections may be seen, and Bills of Quantities, Specifications and Forms of Tender obtained, on application to Mr. John A. Angell, Surveyor, on and after January 11th, on the production of a receipt from the Collector for a deposit of £1, which will be returned on the receipt of a *bonâ-fide* Tender.

A clause will be inserted in the Contract providing that the Contractor shall (1) pay to the employees the wages generally accepted as current for workmen engaged on similar work in the town where the work is executed, not [illegible] to the extent of 75 per cent. at least of the staff required in the execution of such works, give preference to and engage such competent workmen of the class required as may be *bonâ-fide* residents in the Parish of Beckenham, and may offer themselves for employment.

Tenders, duly sealed and endorsed "Tenders for Culverts," to reach undersigned not later than 4 p.m., Monday, January 25, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
F. STEVENS,
Clerk of the Council.

[illegible] 1915. (2,235)

BECKENHAM URBAN DISTRICT COUNCIL.

TO CONTRACTORS

The Beckenham Urban District Council invite Tenders for the making up of St. George's-road, Beckenham. The works comprise the excavation and laying of about 900 lin. yds. granite kerb and channelling, 300 sq. yds. of tarmac, 200 cub. yds. metal for 700 sup. yds. of footpaths, and other incidental works.

Plans and Sections may be seen, and Bills of Quantities, Specification and Forms of Tender obtained on application to Mr. [illegible] Surveyor, on and after January 11th, on the production of a receipt from the Collector for a deposit of £2 which will be returned on the receipt of a *bonâ-fide* Tender.

A clause will be inserted in the Contract providing that the Contractor shall (1) pay to the employes the wages generally accepted as current for workmen engaged on similar work in the town where the work is executed, and (2) to the extent of 75 per cent at least of the staff required in the execution of such works, give preference to and engage such competent [illegible] of the class required as may be found [illegible] residents in the Parish of Beckenham, and may offer themselves for employment.

Payment under the Contract will not be made until six months after the completion of the works.

Tenders, duly sealed and endorsed "Tenders for Street Works," addressed to the undersigned, must be delivered not later than 4 p.m., Monday, January 25, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

F. STEVENS,
Clerk of the Council.

January 6, 1915. (2,250)

RURAL DISTRICT COUNCIL OF CLUTTON

TAR

The Rural District Council of Clutton invite Tenders for about ten thousand gallons of Coal Tar, complying in every respect with Road Board's Specification No. 5, Specification for Tar No. 2.

The Tar to be delivered in full truck-loads, and in sound and good barrels, carriage paid, at Hallatrow or Pensford Station, in such quantities and at such times as required by the Council's Surveyor.

All Tar to be delivered between the 31st March and 1st July, 1915.

The barrels will be returned to the Contractor, carriage paid, but the Council will accept no liability for damage thereto, and will make no payment in respect thereof.

The decision of the Council's Surveyor as to the quality of the Tar, and all other matters arising out of this advertisement, to be final and binding.

Tenders to reach the undersigned on or before 26th instant.

By order,

J. SUMNER DRURY,
Clerk to the Council.

Temple Cloud,
Bristol.
January 7, 1915. (2,257)

BOROUGH OF CHELTENHAM

YEARLY TENDERS

Tenders are invited for the supply of the [illegible] for the year ending 31st March, 1916: Portland Cement, Forage, Stoneware Pipes, Broken Stone, Disinfectants, Oils, Colours, &c., Ironmongery (including wrought-iron Tree Guards), Timber (including Wheelbarrows and Street Orderly Trucks), Indiarubber Goods, Lead (Sheet, Pig, Pipe and Tape), and Brass Fittings, Tools for Highways, &c., Wrought Iron, Steel, Files, &c.; Electric Light Fittings, Household Goods, Sundries, &c. (including Cotton Waste, Bathing Drawers, Towels, Road Brooms, &c.); Lias Lime, Bricks, &c.; Clothing (including Uniforms, Flannel Suits, Waterproofs, Overalls, &c.).

Forms of Tender may be obtained from the undersigned, to whom sealed and endorsed Tenders are to be delivered not later than the 30th January, 1915. The lowest or any Tender will not necessarily be accepted.

J. S. PICKERING,
Borough Engineer.

Municipal Offices, Cheltenham.
January 6, 1915. (2,236)

SOME RECENT PUBLICATIONS.*

ARCHITECTS' AND SURVEYORS' DIARY. [illegible] Limited.

We have received [illegible] Surveyors' Diary" for 1915, and the publishers are [illegible] tion. It contains over 400 pages of information on all subjects of interest to surveyors, and there is an [illegible] year's work.

Manufacture of Concrete Paving Slabs.—Mr. W. White Cooper, engineer and surveyor to the Slough Urban District Council, will be glad to have the names and addresses of firms who make machines [illegible] clinker.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 1.30 P.M. ON TUESDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, [illegible] THE SURVEYOR, [illegible] WESTMINSTER. [illegible] *only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BOROUGH ENGINEER AND SURVEYOR, AND WATER ENGINEER. [illegible]

BURGH ENGINEER.—January 9th.—Corporation [illegible] clerk.

SURVEYOR. January 12th.—Sandgate Urban District Council. £109 per annum.—Mr. J. S. Atkinson, clerk.

WATER ENGINEER.—January 13th.—Abertillery and District Water Board, Monmouthshire. £150 per annum.—Mr. T. S. Edwards, clerk, 24 Stone-hill, Newport, Mon.

CITY SURVEYOR. January 14th.—City of Ripon. [illegible] Hall.

ROAD FOREMAN.—January 14th.—Merton and Morden Urban District Council. £2 per week.—Mr. G. Jerram, surveyor, Council Offices, Kingston-road, Merton, Surrey.

GENERAL ASSISTANT. January 18th.—Ulverston Urban District Council. £1 15s. per week.—Mr. C. Telford Hague, surveyor, Town Hall, Ulverston.

CLERK OF WORKS.—January 18th.—Pembrokeshire Education Committee. £2 2s. per week. Mr. O. T. Thomas, architect, County Education Offices, Haverfordwest.

CLERK OF WORKS.—January 19th.—Rochford Rural District Council. £3 3s. per week.—Mr. Frederic Gregson, clerk.

DISTRICT SURVEYOR.—January 20th.—Williton Rural District Council. £150 per annum, with an allowance of £40 for a motor.—Mr. Frank Risdon, clerk, Williton, Taunton.

GENERAL FOREMAN. January 21st.—Corporation of Guildford. 50s. per week, with house and cycle.—Mr. A. D. Jenkins, town clerk.

CITY ENGINEER AND SURVEYOR.—January 31st, 1915.—Port-of-Spain Corporation. £725, inclusive of travelling allowance.—Mr. Joseph Arnold Lamy, town clerk, Town Hall, Port-of-Spain, Trinidad, B.W.I.

CHIEF SANITARY OFFICER.—February 15th.—Jharia Board of Health, India. £80—£100 per month.—Mr. S. R. Hignall, deputy commissioner of Manbhum, and chairman of the Jharia Board of Health, Purulia, B.N.Ry., Bihar and Orissa, India.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

PAVIOR AND FLAGGER.—Aylesbury Urban District Council. Mr. W. H. Taylor, [illegible] veyor, Town Hall.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

ASSISTANT ENGINEERS.—Public Works Department, Government of the Gold Coast. £350—£400, with furnished quarters. Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

SANITARY INSPECTORS.—For Government work on Salisbury Plain. £156 per annum.—Messrs. Wort & Way, Government contractors, Salisbury.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

DONCASTER.—January 23rd.—Designs for laying out a site of 20 acres for the erection of 102 workmen's houses, for the corporation.—Mr. R. A. H. Tovey, town clerk.

LIVERPOOL.—February 8th.—Designs for working-class dwellings, for the corporation. Premiums, £100, £50, and £25.—Mr. E. R. Pickmere, town clerk.

WALTHAMSTOW.—Plans for the erection of workmen's dwellings at an estimated cost of £16,000, for the urban district council.—Mr. C. S. Watson, clerk, Town Hall.

BRADFORD.—Designs for the re-planning of streets in the central area of the city, for the corporation.—Mr. Reginald Blomfield, R.A., has been nominated assessor.—Mr. F. Stevens, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

ABERSYCHAN.—January 9th.—For the erection of a fire station, for the urban district council.—The Surveyor.

SELBY.—January 11th.—For the construction of public conveniences, for the corporation.—Mr. B. McG. Gray, surveyor.

LEIGH.—January 11th.—For the erection of 238 cottages, for the corporation.—Mr. T. Hunter, borough engineer.

BRISTOL.—January 11th.—For the erection of a ferro-concrete tobacco warehouse, for the Docks Committee.—Mr. W. W. Squire, engineer, Cumberland-road, Bristol.

BARROW.—January 11th.—For the erection of sheds at the abattoirs, for the corporation.—Borough Engineer and Surveyor.

TOBERCURRY.—January 11th.—For the erection of labourers' cottages, for the rural district council.—Mr. W. V. Donohoe, clerk.

SHREWSBURY.—January 12th.—For extensions to a school, for the Education Committee.—Mr. W. Scott-Deakin, architect, 12A Pride-hill, Shrewsbury.

COVENTRY.—January 13th.—For the enlargement of a school, for the Education Committee.—Messrs. G. & I. Steane, 22 Little Park-street, Coventry.

DUBLIN.—January 13th.—For the erection of working-class houses, for the corporation.—City Treasurer, Municipal Buildings.

LEEDS.—January 13th.—For proposed subway works, for the corporation.—Mr. W. T. Lancashire, city engineer.

MARSHLAND.—January 13th.—For the erection of sixty-four houses, for the rural district council.—Mr. E. A. Walker, architect, 44 Market-place, Wisbech.

EASTBOURNE.—January 15th.—For additions to the dispensary, for the corporation.—Mr. W. C. Field, borough architect and building surveyor, Town Hall.

NEWPORT (Mon.).—January 15th.—For the enlargement of a school, for the corporation.—Mr. C. F. Ward, borough architect.

DERBY.—January 15th.—For additions to a hospital, for the corporation.—Mr. J. Ward, borough surveyor.

WEST BROMWICH.—January 15th.—For the erection of a school, for the Education Committee.—Mr. A. Long, architect, New-street.

ASHTON-UNDER-LYNE.—January 16th.—For the erection of a school, for the Education Committee.—Messrs. Eaton, Son & Cantrell, architects, Stamford-street, Ashton-under-Lyne.

PORTSMOUTH.—January 18th.—For the erection of a school, for the Education Committee.—Mr. A. E. Cogswell, architect, Prudential Buildings, Portsmouth.

MONMOUTH.—January 18th.—For the erection of two schools, for the Education Committee.—Mr. J. Bain, County Council Offices, Newport.

HAMPSHIRE.—January 19th.—For the erection of offices for 305 children on the site of a new school, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

WARRINGTON.—January 19th.—For the erection of six cast-iron tramway shelters, for the corporation.—Borough Surveyor.

COLCHESTER.—January 20th.—For additions to a hospital, for the Borough and Port Health Committee.—Mr. H. Collins, borough engineer and surveyor.

MANCHESTER.—January 20th.—For alterations to a school, for the Education Committee.—Education Offices, Deansgate.

GALWAY.—January 23rd.—For the erection of a sanatorium, for the county council.—Mr. W. A. Scott, architect, 45 Mountjoy-square, Dublin.

PRESTON (Sussex).—January 25th.—For the erection of four cottages, for the rural district council.—Mr. A. Shelley, Littlehampton.

LUDLOW.—January 26th.—For the erection of twenty-two cottages, for the corporation.—Mr. J. Butters, architect, Ludlow.

UPHOLLAND.—January 30th.—For the erection of eight workmen's houses, for the urban district council.—Mr. A. Hunt, surveyor.

BOMBAY.—March 7th (date extended).—For the erection and equipment of a refuse destructor, for the Municipal Commissioner.—Messrs. Henry S. King & Co., 65 Cornhill, London, E.C.

MERIONETH.—For the erection of a school, for the Education Committee.—Messrs. Deakin & Howard Jones, architects, Plas Ynys, Borth.

Iron and Steel.

NEWMARKET.—January 11th.—For sinking a well and borehole, for the rural district council.—Messrs. Sands & Walker, engineers, Milton Chambers, Nottingham.

NANTWICH.—January 15th.—For the supply of cast-iron water pipes, branches and other pieces, hydrants, sluice valves, fittings, and excavating and laying cast-iron water mains, for the rural district council.—Mr. C. E. Davenport, 152 Hospital-street, Nantwich.

LLANTRISANT.—January 20th.—For laying pipes and providing valves in connection with the Llantwit Fardre waterworks, for the rural district council.—Mr. G. S. Morgan, engineer, 23 Gelliwasted-road, Pontypridd.

NANTWICH.—January 28th.—For the supply of about 2,100 tons of cast-iron water pipes, branches, and other pieces, hydrants, sluice valves, fittings, and excavating and laying about 50 miles of cast-iron water mains, for the rural district council.—Mr. C. E. Davenport, 152 Hospital-street, Nantwich.

Roads.

LINTHWAITE.—January 11th.—For work of paving with granite setts on concrete, kerbing, flagging, asphalting, and other incidental work, for the urban district council.—Mr. Albert Mallinson, surveyor.

TRING.—January 11th.—For the supply of 12,000 gallons of refined coal tar complying with the Road Board's specification, for the urban district council.—Mr. S. S. Gettings, surveyor.

WOODSTOCK.—January 11th.—For the supply of best hand-picked unbroken stone, best broken stone (2-in. gauge), best double-screened nuts, and binding chippings, for the rural district council.—Mr. A. G. Higgs, clerk.

SALFORD.—January 12th.—For paving, flagging, and sewering, for the corporation.—Borough Engineer.

DONCASTER.—January 12th.—For [illegible] asphalting, for the rural district council.—Mr. W. R. [illegible], Union Offices, Highfield.

MALDEN AND COOMBE.—January 12th.—For the supply of 12,000 [illegible] delivered for, and about 12,000 gallons of creosote for the [illegible] Council Offices, New Malden, Surrey.

BENFIELDSIDE.—January 12th.—For kerbing, channelling, and tar-macadamising, for the urban district council.—Mr. T. Knox, surveyor, Council Offices, Shotley Bridge.

MOUNTAIN ASH.—January 12th.—For road widening, for the urban district council.—Mr. W. G. Thomas, surveyor, Town Hall.

LEWISHAM.—January 12th.—For supplying and laying wood paving, for the borough council.—Borough Surveyor, Town Hall, Catford, S.E.

ROCHDALE.—January 13th.—For making up a street and passage, for the corporation.—Borough Surveyor.

STROOD.—January 13th.—For making up certain roads, for the rural district council.—Mr. L. Randerson, district surveyor, Meopham.

ENFIELD.—January 13th.—For [illegible] road, for the urban district council.—Mr. Richard Collins, surveyor.

UCKFIELD.—January 13th—22nd.—For the supply of broken granite, Mendip stone, broken Kentish ragstone, broken Sevenoaks stone, broken flint, flint grit, and tar, for the rural district council.—Mr. E. W. Ray Johnson, highways surveyor, Buxted.

WORCESTERSHIRE.—January 15th.—For the supply of blast-furnace slag, delivered to railway stations and canal wharves, for the county council.—Mr. C. F. Gettings, county surveyor, Worcester.

DUNDEE.—January 15th.—For laying granolithic paving, for the School Board.—Mr. J. H. Langlands, architect, 31 Murray-gate, Dundee.

WORCESTERSHIRE.—January 15th.—For the supply of granite, delivered to railway stations and canal wharves, for the county council.—Mr. C. F. Gettings, county surveyor, 30 Foregate-street, Worcester.

SPILSBY.—January 15th.—For the supply of about 5,000 tons of broken granite, 7,500 tons of broken slag, and 500 tons of chippings, for the rural district council.—Mr. W. Cooke Brakenridge, district surveyor, Spilsby.

WORCESTERSHIRE.—January 15th.—For the supply of tar-macadam delivered to various railway stations, for the county council.—Mr. C. F. Gettings, county surveyor, 30 Foregate-street, Worcester.

MIDHURST.—January 16th.—For the supply of granite, tar-macadam, and tar, for the rural district council.—Mr. A. G. Gibbs, surveyor.

SHEFFIELD.—January 18th.—For the widening of High Bridge, Penistone-road, for the corporation.—City Engineer, Town Hall.

WANDSWORTH.—January 18th.—For [illegible] certain road, for the borough council.—Mr. P. Dodd, borough surveyor.

SURREY.—January 19th.—For the supply of high-class granites, basalts, slag, tar-macadam, pitch, tar and tar oils, flints, and fine gravel, for the county council.—Mr. A. Dryland, county surveyor, County Hall, Kingston-upon-Thames.

CHERITON.—January 22nd.—For the supply of 500 or 1,000 tons of Welsh, Leicester, or other approved granite, hand-broken to a gauge of 3 in., for the urban district council.—Mr. William R. Coveney, acting surveyor, Public Offices, Cheriton.

CARDIGAN.—January 23rd.—For strengthening and surfacing a main road with Welsh granite, and tar-spraying, for the county council.—Mr. David Davies, county surveyor, Brynhyfryd, Felinfach S.O.

BIRMINGHAM.—January 23rd.—For the supply of granite kerbs, setts, crossing stones, chippings, flags, paving bricks, wood paving blocks, ragstone, limestone, tarred limestone, tarred roadstone, gravel, sand and slag, for the Public Works Committee.—Mr. Henry E. Stilgoe, city engineer and surveyor, Council House.

HERTS.—February 1st.—For the supply of hand-picked surface flints, dug gravel, hoggin, shingle, sand and team labour, for the county council.—Mr. J. S. Killick, county surveyor, Hatfield.

SOMERSET.—February 1st.—For the supply of broken granite or basalt, and steam rolling, for the county council.—Mr. E. Stead, county surveyor, Wells.

ARDSLEY.—For the supply of granite, whinstone, slag, tar for tar-macadam, and surface-tarring work, for the urban district council.—Mr. J. Morley, engineer and surveyor, Council Office, Stairfoot, near Barnsley.

Sanitary.

KENT.—January 11th.—For the construction of rain-water drains, for the Education Committee.—Mr. W. H. Robinson, architect, Sessions House, Maidstone.

GLASGOW.—January 13th.—For the supply and erection of distributors at Dalmarnock sewage works, for the corporation.—Mr. T. Melvin, manager, Sewage Department, 72 Ingram-street.

BATH.—January 13th.—For connecting up sewers to the new system, for the corporation.—Mr. W. H. Radford, engineer, Albion Chambers, King-street, Nottingham.

PONTEFRACT.—January 13th.—For scavenging work, for the rural district council.—Mr. R. Sidebottom, assistant overseer, Southgate, Pontefract.

CHEADLE.—January 14th.—For the removal of house refuse, for the rural district council.—Mr. F. S. Cox, clerk, Union Offices, Cheadle.

HAMBLEDON.—January 15th.—For the collection and removal of refuse, for the rural district council.—Mr. F. Smallpeice, clerk, 138 High-street, Guildford.

DUBLIN.—January 15th.—For constructional works at pumping station, including the erection of a sewage screen, with mechanical cleaning gear and sluice gate, for the corporation.—City Engineer.

KILKENNY.—January 16th.—For the construction of main drainage, for the corporation.—Mr. J. F. Reade, engineer, 29 Baronstrand-street, Waterford.

PLYMOUTH.—January 18th.—For the construction of a 54-in. cast-iron outfall, about 120 ft. in length, on piles, dredging a channel, laying a 54-in. concrete culvert, and other incidental works, for the corporation.—Mr. James Paton, borough engineer and surveyor, Municipal Offices.

MANCHESTER.—January 18th.—For the construction of main drainage work No. 5 (new intercepting sewer, Great Ancoats-street, Swan-street, and Rochdale-road), for the corporation.—City Surveyor.

DARLASTON.—January 21st.—For the construction of stoneware pipe sewers, manholes, cast-iron pipes, tanks, filters, and other works, for the urban district council.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

ROWLEY REGIS.—January 25th.—For relaying sewer and storm-water drain, and other works, for the urban district council.—Council House, Old Hill.

ST. ALBANS.—January 27th.—For the construction of concrete sedimentation and humus tanks, primary and secondary bacteria beds, necessary drains, connections, extension of buildings, and alteration to existing bacteria beds, for the corporation.—Mr. Howard Humphreys, consulting engineer, 28 Victoria-street, Westminster, S.W.

CHAILEY.—January 29th.—For works of sewerage, for the rural district council.—Mr. H. Bertram Nichols, engineer, 11 Victoria-street, Westminster, S.W.

PENDLEBURY.—January 30th.—For the construction of sewers and manholes, for the urban district council.—Mr. H. Entwistle, engineer and surveyor, Council Offices, Swinton, Manchester.

Stores.

PLYMOUTH.—January 16th.—For the supply of paints, varnishes, ironwork, petroleum oil, broomheads, household brushes, iron and steel, pitch-pine, deals, flooring, carbolic powder, Portland cement, tar, pitch, painters' brushes, explosives, creosote, disinfectant fluid, granite kerbs, setts, tools, india-rubber goods, hose, and shipchandler's goods, for the corporation.—Mr. James Paton, borough engineer and surveyor.

ROTHERHAM.—January 18th.—For the supply of stores, for the gas department of the corporation.—The Manager, Gasworks.

ST. PANCRAS.—January 18th.—For the supply of horse water-vans, horse road-sweeping and other machines, cartage, timber and joinery, creosoted deal

blocks, Jarrah wood blocks, barrows, trucks, handles, paints, oils, candles, chandlery, smiths' and founders' works, ironmongery, tools, hardware goods, Yorkshire stone, artificial slabs, granite kerbs, paving setts, broken granite, Kentish rag, gravel and other roadway materials, lime, cement, bricks, stoneware pipes, glazed goods, brass brooms, horse brush backs, tarpaulins, hemp and rubber goods, pitch, tar, creosote oil, carbolic powder, coke, and the removal of road sweepings and gully soil, for the borough council. Mr. Nisbet Blain, borough engineer and surveyor.

BIRMINGHAM. January 20th 23rd. For the supply of lias lime, Portland cement, drain pipes, gullies, gully pans, brown bricks, timber, drysaltery, malleable-iron castings, iron castings, galvanised goods, iron and steel ware, lamps, glass, enamelling, brooms, hose pipe, hose couplings, rubber goods, incandescent mantles, cane sewer rods, chamois leathers, tarpaulings, lines, cords, mops, coke, and bags, for the Public Works Committee.—Mr. Henry E. Stilgoe, city engineer and surveyor, Council House.

BIRMINGHAM.—January 23rd.—For the supply of uniform clothing, for the Public Work Committee.—Mr. Henry E. Stilgoe, city engineer and surveyor, Council House.

SHEFFIELD. January 23rd. For the supply of cement, earthenware pipes, blocks, traps, concrete flags, granite setts, kerb, ringsmith, gravel, chip limestone, slag, shingle, pitch, tar, and creosote oil, for the Highways and Sewerage Committee.—Mr. W. J. Hadfield, city surveyor, Town Hall.

CHISWICK.—January 27th.—For the supply of oils, motor spirit, drysaltery, ironmongery, disinfectants, alumino-ferric or copperas, lime, cement, Kentish pit flints, hoggin, blue Guernsey granite, and other broken road stone, York and other paving, tarred granite slag and limestone paving, tar, asphalt, pipes, gullies, sludge presses, and hire of horses and drivers, for the urban district council.—Mr. Edward Willis, surveyor, Town Hall.

OTLEY.—January 29th.—For the supply of granite, limestone, tar-macadam, slag dust, setts, kerb, flags, paving, brushes, coal, and hauling stone, for the urban district council.—Mr. C. F. Hodgson, surveyor, Council Offices, Otley.

Miscellaneous.

EAST GRINSTEAD. January 20th. For the sale of a steam roller, No. 2,711, by Aveling & Porter.—Mr. Charles Turton, surveyor, 6 High-street, East Grinstead.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance

‡ Provisionally accepted.

ARKLOW.—For the erection of 100 houses, for the urban district council.—Mr. L. O'Toole.

M. Foley, Arklow	£16,758
W. King, Arklow	12,250
Walsh, Dublin	14,887
M. Nolby, Dublin	16,450

The latter tender was for the lot.

CHORLEY.—For the erection of shelters and caretaker's office, for the corporation.—Mr. W. Leech, borough surveyor:—

J. W. Hall, Chorley.
J. Fairclough & Sons, Chorley.
W. Hampson, Chorley.
S. Broom & Sons, Chorley.
L. Bramble, Chorley.
W. Cary, Chorley.
Cunliffe & Sons, Accrington.

DURHAM.—For sewerage works, for the rural district council.—Mr. G. Greenwell, surveyor.

At Shincliffe.

J. Douglass, Newcastle-on-Tyne	£788
J. Garrick, Durham	700
R. Oliver, Gilesgate Moor	557

At Sherburn.

J. Douglass, Newcastle-on-Tyne	£978
J. Garrick, Durham	750
A. Armourey & Co., Willington	145
R. Oliver, Gilesgate Moor	125

GRIMSBY.—For additions to the public library, for the corporation.—Mr. H. G. Wright, borough engineer and surveyor:—

L. Barkworth, Cleethorpes	£181
Edwards & Rayner, Grimsby	152
J. Borrill, Grimsby	120

Borough engineer's estimate, £135.

PRESTON.—Accepted for the erection of baths and tramway offices and sheds, for the corporation.—Mr. T. Cookson, borough surveyor:—

Baths.—T. Croft & Sons, Limited, Preston, £11,870. (Does not include cost of filtration and aëration of water plant.)

Tramway Offices and Car Sheds.—T. Croft & Sons, Limited, Preston, £4,416.

ROCHDALE.—For making up work and sewering, for the corporation.—Mr. S. S. Platt, borough surveyor:—

Contract No. 446.—S. Kearsley, Rochdale.
Contract No. 447.—J. Horrocks, Westhoughton.

SLEAFORD.—For work in connection with the Anwick water supply, for the rural district council.—Mr. W. B. Marsden, engineer and surveyor.

J. E. Bedford, Halifax	£384
A. & L. Bishop, Manchester	364
H. Ashley, Mansfield	318
Wright Brothers, Lincoln	300
W. Blaze, Sleaford	298
W. Hart, Anwick	295
Walling & Co., Bourne	280
Wallhead Brothers, Ruskington	270
Maxey & Son, Sleaford	265
F. Langley, Kirton	262
Banks & Son, Sleaford	256
J. T. Barnes, Sleaford	253

SLEAFORD.—For work in connection with the Ewerby and district water supply, for the rural district council.—Mr. W. B. Marsden, engineer and surveyor.

J. E. Bedford, Halifax	£7,593
A. & L. Bishop, Manchester	4,284
H. Ashley, Mansfield	3,236
Walling & Co., Bourne	3,200
Banks & Son, Sleaford	3,145
Wright & Son, Lincoln	3,000
F. Langley, Kirton	2,987
Maxey & Son, Sleaford	2,946
Wallhead Brothers, Ruskington	2,914
J. T. Barnes, Sleaford	2,896

YORK.—For the construction of about 1½ lin. yds. of new road, 50 ft. wide, for the corporation.—Mr. F. W. Spurr, city engineer.

C. L. Warren, Wallasey, Cheshire, £3,466.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JANUARY.

12.—Institution of Civil Engineers: Mr. A. L. Bell on "The Lateral Pressure and Resistance of Clay, and the Supporting Power of Clay Foundations." 8 p.m.

15.—Town Planning Institute: Discussion on "The Ruislip-Northwood scheme." 92 Victoria-street, S.W. 8 p.m.

FEBRUARY.

19-20.—Royal Sanitary Institute: Meeting at Manchester.

APPOINTMENTS OPEN.

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BOROUGH OF GUILDFORD.

GENERAL FOREMAN.

The Corporation require the services of an experienced general foreman. Candidates must have a thorough and practical knowledge of modern road construction and maintenance, including tar-macadam, granite, wood and gravel roads, paving of footpaths, street scavenging, house refuse collection, sewerage, and all other duties which generally appertain to the office.

He must be thoroughly experienced in the supervision and organisation of manual and team labour, and be able to ride a cycle.

The person appointed will have charge of the outdoor staff of the Corporation under the direction and [illegible] of the Borough Surveyor.

Wages [illegible] per week, with house and cycle provided by the Corporation.

Applications in candidate's own handwriting, stating age, present and past employment, accompanied by copies of three recent testimonials, to be sent to the undersigned, endorsed "Foreman," on or before Thursday, the 21st January, 1915. Canvassing will [illegible].

A. D. JENKINS,
Town Clerk.

Town Clerk's Office,
Guildford.
January 5, 1915. (2,230)

PORT-OF-SPAIN CITY COUNCIL.

The Council invite applications for the combined posts of City Engineer and Engineer of the Port-of-Spain Water and Sewerage Works.

2. The salary attached to the post of City Engineer is £1,000 a year, and to that of Engineer of Water and Sewerage Works, £500 a year with travelling allowance at the rate of £75 a year.

3. The intention of the Council being that the two posts of "City Engineer" and "Engineer of Water and Sewerage Works" should be held by the same person, every application must be for the two posts combined.

4. The offices are pensionable under the Port-of-Spain Corporation Ordinance, 1914.

5. The appointment, so far as concerns the post of Engineer of Water and Sewerage Works, is subject to the approval of the Governor.

6. Candidates must be corporate members of the Institution of Civil Engineers of England, and must possess experience in the design, construction, and maintenance of waterworks and sewerage systems.

7. Applications, accompanied by not less than three recent testimonials, and stating age and previous experience, must be supported by satisfactory evidence that the candidates possess the qualifications set forth in the preceding paragraph of this notice, and must be forwarded so as to reach the undersigned *not later than the 31st January, 1915.*

8. Candidates must also forward with their applications a medical certificate of fitness for service in the West Indies.

9. The successful candidate will be required to furnish a bond with an approved surety in the sum of £500 for the due performance of the duties of the above offices. He will be required to devote his whole time to the service of the Corporation, and to reside in the City of Port-of-Spain, or within one mile of the limits thereof, and he must be prepared to enter upon the duties of the appointment within one month from the date of the receipt by him of the official notice of his appointment.

JOSEPH ARNOLD LAMY,
Town Clerk.

Town Hall,
Port-of-Spain,
Trinidad, B.W.I. (2,195)

RURAL DISTRICT OF WILLITON
DISTRICT SURVEYOR.

The Williton Rural District Council invite applications for the post of District Highway Surveyor for the Western portion of their District, at a salary of £150 per annum, with an allowance of £40 per annum for motor locomotion which the person appointed will have to provide.

Further particulars can be obtained on application to the undersigned.

Applications, stating age, qualifications and experience, accompanied by copies of not more than three recent testimonials, must be received by me not later than 20th January, 1915.

FRANK RISDON,
Clerk.

Williton, Taunton.
December 30, 1914. (2,209)

ULVERSTON URBAN DISTRICT COUNCIL.

Wanted, in the Surveyor's Office, a General Assistant, at a salary of £1 15s. per week.

Candidates must be good and accurate draughtsmen, surveyors, and levellers, and have a practical knowledge of Sewerage, Street Works and Road Improvement Works. Providing his services are satisfactory, the appointment will be for about two years.

Applications, in the candidate's handwriting, giving full particulars of present and previous appointments, age, &c., accompanied by copies of not more than three testimonials of recent date, endorsed "General Assistant," must reach me by Monday, January 18, 1915.

C. TELFORD HAGUE,
Surveyor.

Town Hall,
Ulverston.
January 5, 1915. (2,231)

PAVIOR AND FLAGGER Wanted during the [illegible] Paving on Acton Street. Wages [illegible] per hour. Applications to be sent to Mr. W. H. Taylor, Engineer and Surveyor, Town Hall, Aylesbury, stating age and experience. (2,228)

WANTED a Temporary Assistant Clerk [illegible] Sewage Works Extension. State experience and salary required, also give references, to Box 1,500, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,227)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING ISSUE, *but these responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their insertion in the weekly list of summaries. Such advertisements may, in case of emergency,* ***only, be telephoned (City No. 1046) subject to later confirmation by letter.***

ARDSLEY URBAN DISTRICT COUNCIL.
ROAD MATERIAL.

The Council invite Tenders for the supply of Granite, Whinstone, Slag, Tar for Tar-macadam, and Surface-tarring work.

Specification and Forms of Tender may be obtained from the undersigned.

J. MORLEY,
Engineer and Surveyor.

Council Office,
Stairfoot,
Nr. Barnsley.
January, 1915. (2,226)

URBAN DISTRICT COUNCIL OF CHISWICK
TO CONTRACTORS AND HAULAGE PROVISION DEALERS AND OTHERS.

Persons desirous of tendering for the execution of work and supply of stores (separately) as under—

For six months, commencing 1st April, 1915:—

For the Hire of Horses and Drivers (with or without carts), Oils, Motor Spirit, Drysaltery, Ironmongery (heavy and light), Disinfectants, Aluminoferric or Copperas, Lime and Cement, Kentish Pit Flints, Hoggin, Blue Guernsey Granite, and other Broken Road Stone, York or other Paving, Tarred Granite Slag and Limestone Paving, Tar, Asphalt, Pipes, Gullies, &c., Printing, Stationery, Forage [illegible] Bedding, Hire of the Steam Pumps, H[illegible] Hire Engine, Petroleum (Grocery, Meat, Bread, &c.), and Maintenance of Fire Alarms, Telephones, &c.—

may obtain Forms of Tender on application, or by sending stamped addressed foolscap envelope to Mr. Edward Willis, ASSOC.M.INST.C.E., Surveyor, Town Hall, Chiswick, where specimens of certain of the goods (other specimens are deposited at the High-road and river depots) and Forms of Contract and Bond may be inspected after the 9th instant, between the hours of 9 a.m. and 1 p.m., or at any other time by appointment.

Tenders are to be made on the prescribed forms, and delivered in sealed envelopes to the undersigned not later than 4 p.m. on Wednesday, the 27th January, 1915.

(By order)
ERNEST F. COLLINS,
(2,232) Clerk of the Council.

THE CARDIGANSHIRE COUNTY COUNCIL.

The Roads and Bridges Committee of the County Council invite Tenders for strengthening and surfacing the Cardigan to Cenarth Main Road, from Maesycoed to Cenarth with Welsh Granite, and Tar-spraying. Plan and Specification, and approximate Bill of Quantities and Form of Tender may be seen at Twyside Llechryd. Form of Tender and Specification can also, on application, be obtained from the County Surveyor.

All Tenders, addressed to the County Surveyor, not later than the 23rd day of January, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

DAVID DAVIES.

County Surveyor's Office,
Felinfach S.O. (2,229)

BOROUGH OF PLYMOUTH.

Tenders are invited for the Construction of a 54-in. Cast-iron Outfall, about 120 ft. in length, on piles; Dredging a Channel 630 ft. in length; Laying a 54-in. Concrete Culvert, about 208 yds. in length, with all incidental Works in connection with the carrying out of the Surface-water scheme of the Eastern High-level Area.

Plans and Specifications may be seen, and Forms of Tender and Bills of Quantities obtained, at the Office of the undersigned on payment of a deposit of £5 in each, which will be returned on receipt of a *bonâ-fide* Tender.

The lowest or any Tender will not necessarily be accepted.

Sealed Tenders, which must be accompanied by the fully priced-out Bill of Quantities, must be delivered not later than 5 p.m. on Monday, January 18th, 1915.

Conditions upon which Forms of Tender will be granted may be seen at my Offices.

JAMES PATON,
Borough Engineer and Surveyor.

Municipal Offices,
Plymouth.
December 29, 1914. (2,205)

BOROUGH OF PLYMOUTH.

Notice is hereby given that, after the expiration of 10 days from the date hereof, the Corporation intend to enter into Contracts for the supply of the following Goods and Materials for one year:

Schedule No. 3.—Section A, Paints.
Section B, Varnishes.
,, 5.—Ironwork.
,, 7.—Petroleum Oil.
,, 8.—Broomheads.
,, 9.—Household Brushes.
,, 10.—Rope.
,, 11.—Iron and Steel.
,, 13.—Pitchpine, Deal, Flooring, &c.
,, 14.—Carbolic Powder.
,, 15.—Portland Cement.
,, 16.—Lubricating Oils.
,, 17.—Tar and Pitch, includes Refined Tar for use in the construction of Tarred Macadam Roads and for Tar-spraying.
,, 18.—Painters' Brushes.
,, 19.—Explosives.
,, 22.—Soap.
,, 23.—Wood Blocks, Soft.
,, 24.—Creosote.
,, 28.—Disinfectant Fluid (Bacteriological Test).
,, 29.—Granite Kerbs, Setts, &c.
,, 30.—White Lead, Red Lead, Linseed Oil, and Turpentine.
,, 31.—Refilling Machine Revolving Brooms.
,, 33.—Benzoline and Motor Spirit.
,, 34.—Tools.
,, 35.—Indiarubber Goods, Hose, &c.
,, 36.—Ship Chandlers' Goods (Sundry Oils, Waste, Grease).

Tenders must be based on the whole of a Schedule (with the exception of Schedules Nos. 3, 22, 29 and 36), and not on any particular item contained therein.

(Separate Tenders will be considered for Sections A and B of Schedule No. 3.)

Schedules may be obtained on payment of a deposit of £1 in cash for each Schedule. The deposits on the Schedules will be returned, provided *bonâ-fide* Tenders are received on or before the 16th January, 1915. Should the Contractor withdraw his Tender, or fail to enter into a contract, the amount of his deposit will be forfeited, and the Contractor who applies for the Schedules must do so on the distinct understanding that he is willing to abide by the terms of this advertisement.

The lowest or any Tender will not necessarily be accepted.

Tenders to be delivered not later than Saturday, January 16, 1915, addressed to the undersigned.

JAMES PATON,
Borough Engineer and Surveyor.

Municipal Offices,
Plymouth.
December 18, 1914. (2,182)

PUBLIC HEALTH ACT, 1875.

CITY OF ST. ALBAN.

EXTENSION OF MAIN SEWERAGE: CONTRACT No. 2.

TO SEWERAGE CONTRACTORS

The Corporation of the City of St. Alban, acting as the Sanitary Authority for the said City, are prepared to receive Tenders for certain works in connection with alterations and additions to the Sewage Disposal Works, near Park-street, on the outskirts of the City of St. Alban.

The works generally will consist of the construction of Concrete Sedimentation and Humus Tanks, Primary and Secondary Bacteria Beds, necessary Drains, Connections, &c., extension of Buildings and alteration to existing Bacteria Beds, &c.

Particulars, Bills of Quantities, and Forms of Tender may be obtained, and Plans may be seen, at the office of the Consulting Engineer, Mr. H. Howard Humphreys, 28 Victoria-street, Westminster, after the 8th day of January, 1915, between the hours of 10 a.m. and 4 p.m.

Intending Contractors will be required to deposit a sum of Three Guineas prior to particulars being furnished, such sum being returned after the Corporation have come to a decision on the Tenders received, provided that the Contractor shall have sent in a *bonâ-fide* Tender, and shall not have withdrawn the same.

The successful Tenderer will be required to execute a Contract the draft of which may be seen at the offices of the Consulting Engineer aforesaid.

Tenders must be on the official form, each Tender in a sealed envelope (which will be provided by the Engineer).

Contractors must, with the Tender, return the Bill of Quantities and Schedule of Prices duly filled in in detail, and signed in the handwriting of the Tenderer or his authorised Agent.

Tenders must reach the undersigned not later than noon on the 27th day of January, 1915. The Corporation do not bind themselves to accept the lowest or any Tender.

Given under my hand this 4th day of January, 1915.

E. P. DEBENHAM,
Town Clerk.

St. Albans. (2,225)

NANTWICH RURAL DISTRICT COUNCIL.

AUDLEM AND DISTRICT: WORKS OF WATER SUPPLY.

CAST-IRON PIPES, HYDRANTS, SLUICE-VALVES, CASTINGS, &c., EXCAVATING FOR AND LAYING AND JOINTING WATER PIPES, &c.

The above Council is desirous of receiving Tenders (Contract No. 1) for about 2,100 tons of Cast-iron Water Pipes, Branches and other pieces; (Contract No. 2) for Hydrants, Sluice Valves, Fittings, &c.; and (Contract No. 3) for Excavating for and Laying, Fixing and Jointing about 50 miles of Cast-iron Water Mains, with all the necessary Sluice Valves, Hydrants, Fittings, &c., in connection with the above-mentioned works of water supply in the Rural District. Separate Tenders will be required for each Contract, and for the four sections (each approximately 12½ miles) in Contract No. 3, but one Contractor may tender for the whole.

The Council does not bind itself to accept the lowest or any Tender, and reserves the right to sub-divide the Contracts in such manner as may be deemed expedient.

Drawings and Specifications may be seen at the Offices of Mr. C. E. Davenport, ASSOC.M.INST.C.E., 152 Hospital-street, Nantwich, from whom copies of Specifications, Quantities and Forms of Tender may be obtained on the deposit of Two Guineas, which sum will be refunded on receipt of a *bonâ-fide* Tender and the return to the Engineer of all documents received from him.

Sealed Tenders to be sent in to me not later than Four o'clock in the afternoon of Thursday, the 28th January next, endorsed "Tender, Audlem, &c., Waterworks."

(By order)
H. G. ATKINSON,
Clerk to the Council.

Rural District Council Offices,
Nantwich.
December 30, 1914. (2,211)

Calno
Reg'd

THE ONLY FIRE-RESISTING FIBRE
BUILDING BOARD
MADE IN
GREAT BRITAIN

Does not Split or Crack. Bound with Cement Binder.
Tensile Strength over 300 lb. to the square inch.

TESTED AND CERTIFIED by the BRITISH FIRE-PREVENTION COMMITTEE.

PASSED by the L.C.C.

Fire and Damp Resisting.

Germ and Sound Proof.

Non-conductor of heat or cold.

Sanitary.

Over 5,000,000 (five million) Square Feet in use by H.M. Government.

Full particulars [illegible]

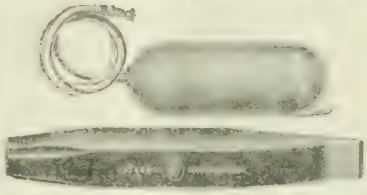
Address: **Thames Mills, Purfleet, Essex**

Telephone [illegible]

THE FIREPROOF FIBRE BUILDING BOARDS, LTD.,
Grams "[illegible]" [illegible] 26 Hart Street, London, W.C

Estd. 1804 Estd.
JOHN
YATES
& CO., LTD.,
Aston Manor, Birmingham

BEST



TOOLS

Grams "YATONIAN" Phones EAST 400, 401, 402.

"J. & A." Pneumatic Ejectors.

As installed for raising sewage at—

ALDERMASTON, nr. Reading.
BINGLEY, Yorks.
ASHTON-IN-MAKERFIELD, Lancs.
West London District Schools, ASHFORD, Middlesex.

. High Efficiency .
Minimum Attention
. Easily Handled .

Low running and prime costs.

Write to-day for Ejector Catalogue S2.

Jones & Attwood, Ltd., HYDRAULIC ENGINEERS, **STOURBRIDGE.**

Telegraphic Address: "HEAT, STOURBRIDGE." Telephone: No. 10.

NANTWICH RURAL DISTRICT COUNCIL.

CAST-IRON PIPES, HYDRANTS, SLUICE-VALVES, CASTINGS, &c.; EXCAVATING FOR AND LAYING AND JOINTING WATER PIPES, &c.

The above Council is desirous of receiving Tenders (Contract No. 1) for Cast-iron Water Pipes, Branches and other pieces; (Contract No. 2) for Hydrants, Sluice Valves, Fittings, &c.; and (Contract No. 3) for Excavating and Laying, Fixing and Jointing Cast-iron Water Mains, with all the necessary Sluice Valves, Hydrants, Fittings, &c., for purposes of water supply in the Township of Ridley, in the above-named Rural District. Separate Tenders will be required for each Contract, but one Contractor may tender for the whole. The Council does not bind itself to accept the lowest or any Tender.

Drawings and Specifications may be seen at the Offices of Mr. C. E. Davenport, ASSOC.M.INST.C.E., 152 Hospital-street, Nantwich, from whom copies of specifications, Quantities and Forms of Tender may be obtained on the deposit of ten shillings, which sum will be refunded on receipt of a *bonâ-fide* Tender, and the return to the Engineer of all documents received from him.

Sealed Tenders to be sent in to me not later than four o'clock in the afternoon of Friday, the 15th January next, endorsed "Tender, Ridley Waterworks."

(By order)

H. G. ATKINSON,
Clerk to the Council.

Rural District Council Offices,
Nantwich.
December 30, 1914. (2.210)

PLEASE MENTION "THE SURVEYOR" WHEN REPLYING TO ADVERTISEMENTS.

CITY OF BIRMINGHAM.

The Public Works Committee are prepared to receive Tenders for the Supply of Stores for one year, ending March 31, 1916—viz.: Lias Lime, Portland Cement, Drain Pipes, Gullies, Gully Pans, Brown Bricks, Timber, Drysaltery, Malleable Iron Castings, Iron Castings, Galvanised Goods, Iron and Steel Ware, Lamps, Glass, Enamelling, Brooms, Hose Pipe, Hose Couplings, Rubber Goods, Incandescent Mantles, and Miscellaneous Stores, including Cane Sewer Rods, Chamois Leathers, Tarpaulins, Lines, Cords, Mops, Coke Bags, &c.

Samples and Patterns may be seen on application to the Storekeeper at the Lamp Department, Cambridge-street, and the Corporation Wharf, Sheepcote-street. Forms of Tender, Copies of Conditions, and Specifications may be obtained, on and after the 4th inst., at the City Surveyor's Office, Council House, Birmingham, on payment of £1 for each copy, which will be returned on the receipt of a *bonâ-fide* Tender for the whole or any portion of the Stores required. Samples of Goods tendered for must be sent, carriage paid, to the undersigned; the samples of Portland Cement, 4 lb. in weight, to be delivered by the 20th January. Tenders must be made out on the Forms provided, and delivered at the undermentioned offices on the 23rd day of January, 1915, endorsed "Tender for Stores," and addressed to the City Surveyor, Council House, Birmingham. The person whose Tender may be accepted will be required to conform with the provisions of the Trade Board's Act, 1909. The Committee do not pledge themselves to accept the lowest or any Tender, and reserve the right to accept portions only of a Tender.

HENRY E. STILGOE,
City Engineer and Surveyor.

The Council House,
Birmingham.
January 4, 1915. (2.221)

MEXPHALTE—

the pure Mexican bitumen—has won its pre-eminent place among road materials ***on its merits.*** Its guaranteed purity—practically 100 % its uniform toughness and ductility—its stability under all variations of climate—have commended it to an ever-growing number of prominent municipal engineers throughout the country.

For asphalt macadam road construction or for grouting work Mexphalte is supreme in the efficiency of its service and the economy of its cost.

— ***Specify for your work for 1915.*** —

Specify Mexphalte for public and private carriageway and footway work during the year. Write for particulars to

ANGLO-MEXICAN
PETROLEUM PRODUCTS CO., Ltd.,
FINSBURY COURT,
LONDON, E.C.

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. JANUARY 15, 1915. No. 1,200.

Minutes of Proceedings.

Extra Remuneration of Surveyors.

The question of the remuneration of surveyors to local authorities for extra work outside the scope of their ordinary duties is always a somewhat difficult one by reason of the legal anomalies surrounding it. The relevant statutory provisions are contained in sections 189 and 193 of the Public Health Act, 1875. Sec. 189 provides that every urban authority shall from time to time appoint fit and proper persons to be medical officer of health, surveyor, inspector of nuisances, clerk, and treasurer, and that, subject, in the case of officers any portion of whose salary is paid out of moneys voted by Parliament, to the powers of the Local Government Board under the Act, the authority may pay to the officers so appointed such reasonable salaries, wages, and allowances as the authority may think proper. The surveyor is not one of the officers part of whose salary was, at the date of the Act, paid out of moneys voted by Parliament (and is now paid by the county council); therefore, upon the face of it, it might be thought that the authority would have a free hand to make whatever arrangement they pleased with the surveyor, both as to salary and as to additional remuneration for extra services. This, however, would be to reckon without sec. 193, which provides that officers appointed under the Act by the local authority shall not in any wise be concerned or interested in any bargain or contract made with such authority for any of the purposes of the Act. If any such officer is so concerned or interested, or, under colour of his office or employment, exacts or accepts any fee or reward whatsoever other than his proper salary, wages and allowances, he is to be incapable of any rewards holding or continuing in any office or employment under the Act, and he is, moreover, to forfeit £50.

Now it is quite clear that this section debars a surveyor from receiving extra remuneration by way of percentage on the contract price for works. This was decided in *Whiteley* v. *Barley* (21 Q.B.D., 151). In that case a firm of contractors undertook to do certain work for a municipal corporation, and the contract contained a clause providing that the surveyor to the corporation should receive from the contractors, in respect of bills of quantities prepared by him, percentages on such amounts as he should certify to be due to the contractors from the corporation. A ratepayer commenced proceedings against the surveyor to recover the £50 penalty, and while such proceedings were pending the corporation passed a resolution to contribute £300 towards the surveyor's costs of defending the action. It was contended on his behalf that, inasmuch as a fixed sum equal to the percentage might have been lawfully paid to the surveyor as an "allowance," the invalidity of the payment was merely one of form. But the Court rejected this plea, and held that the surveyor was liable to the penalty of £50 imposed by this section. Moreover, on a further application, the Court quashed the resolutions of the corporation for the payment both of the percentage and of the £300 contribution voted towards the surveyor's costs and ordered those members of the corporation who had voted in favour of these resolutions to pay the costs of the application out of their own pockets. It may be observed in passing that, under the Public Health (Officers) Act, 1884, proceedings for recovery of the penalty under this section cannot now be taken, except with the consent of the Attorney-General (who presumably would not authorise a purely vexatious action), but in other respects the section remains in full force. The question remains whether it is ever lawful for a local authority to pay their surveyor for extra services outside the scope of his ordinary duties, so long as such payment does not take the form of a percentage or commission, and if so to what extent and in what form. Upon this point the authorities are by no means so clear as could be desired. If we consult Lumley's Public Health Acts (8th edition), we find on the one hand (at pp. 451, 456) a reference to a precedent for such a payment, and on the other hand (at p. 451) a statement which seems, at all events, to restrict the mode in which the object can be effected in a manner which is at the best somewhat arbitrary, and may in some cases be actually prohibitive. The precedent is the case of *Re* v. *Chancery Corporation* (23 J.P., 709). That was the case of a surveyor who had been engaged by the corporation as a "full-time" officer at a fixed salary for purposes connected with their existing and projected waterworks, it being expressly provided by the terms of his engagement that he was not to be paid for extra work. Subsequently, finding him to be qualified as an engineer, they dismissed the engineer who was superintending the construction of their new waterworks, and employed the surveyor in that capacity. It was held that the corporation might legally vote him extra remuneration for these services, which were outside the scope of his original employment.

On the other hand, after the reference to this case, we are confronted with the following statement: "In the case of a surveyor there is a provision authorising the making of an extra-

ordinary payment—*i.e.*, one in addition to salary. The board " (*i.e.*, the Local Government Board) " have suggested in some cases whether the object might not be attained by an increase of the salary of the officer for a definite period, the period and amount of the increase being so calculated as to make the actual benefit equal to that which would accrue if the proposed payment were made in a lump sum. At the same time the board pointed out that, if a council adopted this course, the period for which the increase of salary was awarded must be prospective—*i.e.*, must commence not sooner than the date of the resolution of the council awarding such increase." It is evident that this method, simple as it sounds in theory, may not always be easy of application, as cases may occur in which it may not be possible to gauge in advance the amount of extra work which will fall upon the officer, and for which it is desired that he shall have extra remuneration. But, apart from this, it is surely a sufficient comment on the unsatisfactory state of the law on this point to find that the only way a Government Department can suggest for carrying out the principle that " the labourer is worthy of his hire " is by, we hesitate to say " an evasion of the law " or a " legal fiction," but at all events a roundabout, clumsy, and probably in many cases ineffectual method of accomplishing what is just and fair. It seems to us that this is a matter which calls for the intervention of the Legislature in order to make the position clear.

* * *

Town Planning in 1913-14.

The report of the Local Government Board on Town Planning in 1913-14 shows that the ideas and ideals which underlie the practice of that science continue to make satisfactory progress. This is indicated not only by the increasing appreciation which is shown by local authorities of the advantages offered by the town planning part of the Act of 1909, but also by the fact that landowners are coming to realise more fully that the town planning idea is by no means inimical to their best interests. The board report that the schemes which have come before them have been chiefly concerned with the laying out of the main routes of communication through and from the areas dealt with; with the provision of open spaces; with the limitation of the number of houses which may be erected upon any particular area; with the careful setting back of the building lines, so as not only to secure abundant air space, but also to enable road widenings to take place hereafter at the minimum cost should unforeseen circumstances render those necessary; and with the restriction of factories and similar buildings to particular areas, and the setting aside of particular sites for public purposes. Referring to the conference organised in 1911 by the Institution of Municipal and County Engineers, and to the opinion then expressed by the board that the time had not arrived when it would be prudent to attempt to lay down a complete code of general provisions for insertion in town planning schemes submitted for approval, the report states that this view still holds good. Thus, although of the five schemes made last year, three follow very closely the same lines, the other two are of quite a different character, and are also totally unlike each other. As matter of general advice, however, the report suggests that local authorities should make their schemes as simple as possible, and should avoid complex regulations in regard to matters of taste and detail, and other things which it is not essential to settle at all events in the first instance. The over-elaboration of detail is a fruitful source of friction, and as a rule local authorities will be well advised in the early stages of a scheme to concentrate the attention of all parties upon those fundamentals in regard to which ultimate agreement is essential.

The report deals at length with the schemes which have been made by the Birmingham Corporation, the Rochdale Corporation, and the urban district councils of Ruislip-Northwood and North Bromsgrove. During the year under review authority was given for the preparation of twenty-three new schemes, and at its close twenty-two further applications were under consideration, and in twenty-nine cases the preliminary notices to persons interested had been given. The report shows that there has been considerable activity among the local authorities in the Greater London area, and reference is made to the question of arterial roads, in regard to which, it will be recollected, six important sectional conferences were held last year under the auspices of the board. Town planning in this country is still in its infancy, and although much has been accomplished since the passing of the Act of 1909, very much more remains to be done. It is satisfactory, therefore, to read this record of the activities of local authorities in the matter.

* *

Departmental Competition at Walsall.

There is a good deal of human nature even on municipal corporations, and it is not therefore surprising to read that at Walsall, where the gas and electricity undertakings belong to the town council, the business in connection with these concerns is carried on upon competitive lines. There was no disguise of the rivalry at the meeting of the town council on Monday, when the question to be decided was whether the new street which is being constructed to improve the approach to the town from the Birmingham road should be lighted with gas or electricity. The General Purposes Committee, which comprises the whole council, had reversed the decision of the Streets Committee, and had decided that the thoroughfare should be lighted by electricity. An attempt was made on Monday to get this upset, and in the course of the discussion it appeared that the Gas Committee had offered to maintain lights of 320-candle power at almost as low a price as the Electricity Committee quoted for 150-candle-power lights, and the latter department also wanted a guarantee that a supply would be taken for fifteen years. It appeared from the statement of the chairman of the Electricity Committee that at present the Gas Committee has almost a monopoly of public lighting. This is resented by the Electricity Committee, who propose to show in the new street what could be done in the way of public lighting, and they—so the chairman definitely asserted quite in the familiar language of the enterprising chief of a commercial undertaking—" would not be content until they had control of the whole street lighting of the town." What the chairman of the Gas Committee thought of this aggressive attitude on the part of his rival was plainly in evidence by his retort that " electricity had proved a failure wherever it had been tried for street lighting." Here we have also reflexed with almost 320-candle-power clarity the confident trading spirit animating the management of the municipal gas department. Whether, as a councillor suggested, that spirit would be subdued by vesting the control of both the gas and electricity concerns in one committee, or whether it should be subdued at all, are questions not easily answered. After all, the rivalry between the departments is merely a manifestation of that competition which individualists are in the habit of declaring is the soul of business. Whether it is being exercised unwisely, and therefore to the prejudice of one department or the other, is a problem which the ratepayers should, and probably will, settle themselves.

Flies and Health.

A few years ago to have asked the question, Do house-flies hibernate? would probably have provoked a laugh, but the results of modern research in showing that these pests are active carriers of infection has invested the question with a real seriousness. It was in 1908 that the Local Government Board authorised further experimental work in connection with the investigation of flies as carriers of infection, and the results of these experiments are embodied in a very interesting report that has just been issued. A large amount of information of general and scientific interest, and having important practical bearings in relation to public health, had previously been obtained. There still remain, however, for solution a number of problems relating to the life history of flies and their *role* as potential carriers of infection. The report under notice gives some contribution towards the determination of certain of these problems. It contains papers on (1) Hibernation of House-flies, by Dr. Copeman and Mr. Austen, in continuation of a paper by Dr. Copeman dealing with the same subject in the last report of the present series; (2) Investigation of the results obtained by Mr. Edgar Hesse on the destruction of flies by means of bacterial cultures, by Dr. Bernstein; and (3) Investigation of work, also initiated by Mr. Edgar Hesse, on the culture of the fly-fungus, *Empusa Muscæ*, by Mr. Ramsbottom, of the British Museum (Natural History). Determination of the circumstances under which flies are enabled to perpetuate their species from one year to another is obviously important in order that means may be devised for organised attack on the progenitors of the next season's fly population when most likely to prove effective. The one specially interesting and unexpected point emerging from the former inquiry was that not a single specimen of the house-fly (*Musca domestica*) was met with among the considerable number of hibernating flies caught in situations which have hitherto been regarded as the special habitat of this fly. Under these circumstances it was felt that further detailed investigation of the matter was needed, and accordingly enquiry on a more extended scale, and covering, as it proved, an extensive area, was initiated and carried through during the past winter. Once more, however, the results obtained afford no support to the belief that house-flies hibernate, in this country, in the adult state; and the problem as to the manner in which the species survives one season and the next is bridged over still remains unsolved.

Registration of Architects.

The annual report of the council of the Society of Architects for the year ended October 31, 1914, refers at some length to the question of registration—a matter in which the Society has taken a keen interest for some time past. It is, perhaps, a little unfortunate that there has been a fundamental difference of opinion between the society and the Royal Institute of British Architects as to the policy to be adopted, although both bodies have brought forward concrete proposals for registration in one form or another. In the early part of last year the institute decided not to proceed with a Registration Bill for the present, but to apply for an extension of their charter to enable them to confer the title of chartered architect upon all persons passing a stated examination, thus adopting a policy of voluntary registration within the institute. The society, on the other hand, have caused to be drafted a Bill embodying a policy of statutory registration for every member of the profession, whether belonging to an architectural body or not. The outbreak of the war has for the time being put a stop to the active promotion of both schemes, and the council, in their report, now express the hope that, as the war has had the good effect of drawing together the members of the architectural profession without reference to professional politics, this happy state may continue, so that by the time peace is declared some method may have been arrived at of settling any differences in regard to the means to be adopted in attaining the end which both the society and the institute have in view. We cannot but feel that such unity of purpose would in itself be a great asset in securing the success of any scheme which may be agreed upon. In this connection it is interesting to observe that the New Zealand Institute of Architects was successful last July in obtaining a Registration Act, having accomplished in one year what the profession at home has been seeking for thirty years. The report also makes reference among other matters to the action which has been taken by the council in regard to unsatisfactory competitions. In such cases, where amendments have not been secured, the competition has been barred, and members have been warned not to take part in it. On three occasions during the year the warning was disregarded, and the architects concerned are no longer members of the society.

Concrete and Sanitation.

The subject under consideration at the last meeting of the Concrete Institute was the "Application of Concrete in Modern Sanitation," and was introduced in an able and comprehensive paper by Mr. Henry J. Tingle, M.INST.C.E. The subject is one of great practical importance, in view of the ever-increasing tendency to use concrete, either plain or reinforced, in the construction of sanitary works of any magnitude. It is a common complaint against the Local Government Board that they are responsible for retarding the progress of reinforced concrete construction to a very great extent, owing to the unenlightened policy which they continue to pursue in regard to loan periods. This observation applies with peculiar force to sanitary works which are almost invariably undertaken by local authorities, and paid for by money raised by loans to which the sanction of the board has to be obtained. The present practice of the board is, as Mr. Tingle pointed out, in the case of reinforced concrete for works in contact with water or sewage, to require the capital sum to be paid off in a period of ten years, while in the case of ordinary concrete, under the same conditions, the period of repayment is thirty years. The result, of course, is that, although the initial cost of reinforced concrete is appreciably lower, the short loan period and the consequent high annual charge for repayment afford convincing reasons to most local authorities for neglecting the use of this material. A good deal of the earlier part of Mr. Tingle's paper was devoted to interesting particulars of concrete tubes, their strength and uses in various positions, while a description of the manufacture of such tubes by several firms forms a most valuable and interesting appendix. Although, as a rule, concrete tubes do not suffer any damage from contact with sewage, occasional instances of disintegration have been recorded, and further investigation appears to be necessary in order to ascertain the causes and learn the lessons of these failures. The investigation of failures is always a most valuable means of instruction if undertaken in the right spirit—a fact of which Mr. Tingle showed his appreciation by dealing at length with the failure and reconstruction of a concrete-covered reservoir, and temperature cracks in a concrete reservoir wall, both of which had occurred in his own experience.

Some Notes on the Progress Report of the American Public Health Association.

(SANITARY ENGINEERING SECTION.)

By G. BERTRAM KERSHAW, M.Am.Soc.C.E., M.Inst.C.E., Late Engineer to the Royal Commission on Sewage Disposal.

The above report forms a document of particular interest to the engineer who specialises in sewage matters, and who must feel that it is yearly becoming more and more necessary to have a good working knowledge of the chemistry of sewage if the results achieved by his schemes are to be attended with success.

The report is divided into two parts, Part I. dealing with sewage works operation, while Part II. is devoted to the question of analytical methods.

Part I. opens with the statement that "the introduction of sewer systems . . . has brought about the need for treatment of sewage, in order to accomplish two purposes: —

"(*a*) To promote the comfort and convenience of the people by maintaining watercourses in a decently clean condition—that is, free from nuisance to sight or smell—so as to be fit for civic development, industry and recreation."

The word "nuisance"* is, perhaps, an unfortunate word to employ, since so much depends upon the personal equation; but it is difficult to suggest any other. Possibly "perceptible smell or unsightliness" would meet the case better.

It should be noted that certain trade waste waters, without causing nuisance to sight or smell, are withal often very hard when discharged from mill premises, and they are frequently subjected to purification processes which greatly increase this hardness. In many industries manufacturers would prefer a polluted water for industrial uses rather than a clean water of a high degree of hardness. The writer is under the impression that hardness of water has been held to come under the heading of pollution. Again, a practically clean water may indirectly bring about a serious nuisance in a stream—*e.g.*, hot condenser water, this causing destruction and decay of water weeds, and lowering the amount of oxygen which the stream water can hold in solution.

Heading (*b*): "To aid in protecting the public health when necessary by maintaining watercourses as fit sources of water supply, after adequate purification, or for the cultivation of shellfish."

This paragraph evidently implies—taken in conjunction with later observations—that, if the sewage works effluent goes wrong, some near-by source of water used for drinking purposes may be endangered.

It would seem a very doubtful policy to place any faith in a water supply undertaking which relied, even in part, for the purity of its water, and consequently for the safety of its consumers, upon the continued and uniform efficiency of an adjacent sewage works. Even supposing the effluent from a sewage works were uniformly of a high degree of excellence—a thing impracticable except in theory—storm overflow discharges would still presumably provide a source of danger.

The Sewage Disposal Commission, in their Fifth Report, paragraph 360, say: "We are convinced that rivers generally—those traversing agricultural as well as those draining manufacturing or urban areas, are necessarily exposed to other pollutions besides sewage, and it appears to us, therefore, that any authority taking water from such rivers for the purpose of water supply must be held to be aware of the risks to which the water is exposed, and that it should be regarded as part of the duty of that authority systematically and thoroughly to purify the water before distributing it to their customers."

It is to be noted that the committee, in dealing with the degree of technical skill required for [illegible] and efficient operation, point out that "it does not always follow because a sewage treatment works receives a large volume of sewage that the responsibility is in proportion to the magnitude. . . ." This fact is very often lost sight of. During the past sixteen years the writer has travelled some 500,000 miles in this country inspecting some hundred or [illegible] works, and he has seen several medium-sized sewage works of a somewhat indifferent character, both as regards design and construction, where a highly capable manager, by unremitting care and attention, has achieved results far better than would have been thought possible. It seems doubtful, given two sewage works, one a very large one and the other a small or medium-sized one, both treating similar sewages by identical processes, whether the large works can, or at any rate would, on the average, produce an effluent of so good a quality as the smaller works. Sub-division of management probably has something to do with it as regards the large works, but many other factors come into play.

Of special importance is the suggestion that the engineer responsible for the works, or some other competent person, should be called in at regular intervals to inspect and advise concerning the working of the plant. Such an inspection is common enough as regards machinery, boilers, &c., and there would seem to be no valid reason against making use of such a system where sewage works are concerned.

Most people will agree with the committee that the right type of manager is worth a good salary; yet how rarely is this found to be the case? It is impossible to get the right man for such a post without paying for it.

The fact that river-water temperatures during some four or five months of the year are very low, and that consequently there is less likelihood of smell at such times, has not been lost sight of in the report. During the cold months of the year river-water temperatures are often not much above 40 deg. Fahr., at which temperature clean river water will contain some 9 c.c. of oxygen per litre, whereas when the river water is of a temperature of 60 deg. Fahr., it has only a content of about 7 c.c. In hot weather, on the other hand, water-weeds and sunshine, together with many other purifying [illegible] come into action and go towards making up the deficit.

In connection with this point the writer may, perhaps, be permitted to quote from a book of his which is about to be published—viz.: "During the cool months of the year, it is an undoubted fact that a river or stream can receive more pollution without becoming a nuisance to the senses than would be possible in hot weather; in other words, a river receiving a constant degree of pollution throughout the [illegible] in hot weather, which would be totally absent in the winter."

Those who have had the misfortune to have to wade through screeds containing innumerable figures and voluminous chemical analyses will endorse the suggestion that records should not be encumbered with useless data, while the essentials should be made graphic wherever possible. It is extraordinary to see how often masses of figures are presented numerically when, if plotted graphically, they could be followed infinitely better: they would also occupy less space.

Coming to Part II. of the report, this is concerned with analytical methods, and perhaps it is presumptuous for an engineer to offer any comments; it is, however, beginning to be realised that, in order to be in a position to deal effectively and at the same time economically with sewage problems, it is necessary for the engineer specialising in this branch to possess at least a rudimentary knowledge of the chemistry of sewage.

In this respect it may be [illegible] that American engineers are considerably ahead of us, and it will be found that most American sewage engineers of any standing are not only able to interpret sewage and effluent analyses correctly, but quite capable, should occasion arise, of carrying out various tests themselves.

It is refreshing to note in paragraph 2 that a new line has been taken as regards tests for sewage and sewage effluents, and that the tests are the outcome

* "Nuisance," [illegible] has been [illegible] defined as "something materially interfering with the ordinary comfort physically or human existence."—G. B. K.

[illegible] sewage rather than using [illegible] under [illegible] conditions.

In Part II. paragraph [illegible] [illegible] preliminary treatment [illegible] effluents might be omitted [illegible] [illegible] [illegible]

The Application of Concrete in Modern Sanitation.*

By HENRY J. TINGLE, M.Inst.C.E.

Concrete has played its part in sanitation for many years, with more or less success, according to the skill of the designer and the quality of the materials and workmanship. The tendency in recent years has been to employ concrete more and more, and this tendency in the future is sure to extend its use in directions where now it is scarcely applied. Sanitation works have been particularly affected by the attitude of the Local Government Board towards reinforced concrete, as such works are generally undertaken by local authorities, who have to obtain the sanction of the board to the raising of a loan for the amount of capital expenditure, or else to obtain Parliamentary powers by means of a private Act. The great majority of authorities, however, adopt the first of these two courses of procedure, and the practice of the board is, in the case of reinforced concrete for works in contact with water or sewage, to require the capital sum to be paid off in a period of ten years, while in the case of ordinary concrete, under the same conditions, the period of repayment is thirty years. In cases where, in addition to reinforced concrete in contact with water, there is reinforced concrete not in contact with water, the periods for the loans on each class are sometimes equated together, and the loan for the whole granted for the period given by the equation.

Doubtless, in the early years of reinforced concrete, the board were well advised to act cautiously in the matter of sanctioning loans for the use of a combination of materials of which, in this country, there had been scarcely any experience, either as to its suitability or as to its life in sanitation works. The effect of this differentiation on the part of the board in the treatment of concrete, and of reinforced concrete, has been to curtail the employment of the latter in public works of sanitation. It is clear that, under the present conditions, where the loan is obtained for reinforced concrete, the burden thrown on the ratepayers annually to repay the principal and interest in equal annual instalments spread over ten years would be more than twice as great as for a loan of equal amount and rate of interest obtained for ordinary concrete, to be repaid in equal annual instalments in thirty years. The following example will illustrate the matter: If £1,000 be borrowed at 3½ per cent interest, to be repaid in equal half-yearly instalments of principal and interest for a term of ten years, the amount to be paid each half year equals £60 8s. 6d., and if for a term of thirty years the amount to be paid each half year equals £27 18s. 1d. The difference between those two amounts is, approximately, £32 10s., which is 116 per cent of £28.

Under these circumstances it is only natural that most authorities elect to use ordinary concrete in order to ease the burden on the present ratepayers, and throw part of it upon the ratepayers of the future.

The effect of the differentiation amounts to this, that, unless the cost of the works can be considerably reduced by the employment of reinforced concrete as compared to ordinary concrete, there is but little probability of local authorities deciding in favour of the former. The requisite saving may be effected in some instances, but, so far as the experience of the author goes, this is not generally the case.

With the experience that has now been obtained relating to the behaviour of reinforced concrete that is constantly in contact either with water or with sewage, it is permissible to hope that the time is not far distant when the Local Government Board will reconsider its attitude towards this material, and, in cases where it is proposed to make use of it, will sanction loans on more favourable terms as to the period of repayment than those now in force.

Concrete has been and is now extensively used in the construction of reservoirs, sewage tanks, filters, aqueducts, and water towers. Full descriptions of these works are to be found in technical journals and volumes of proceedings of the various engineering societies. The same holds good for similar structures in reinforced concrete, though to a more limited extent; but numerous examples are given in the catalogues issued by the various firms specialising in this class of work.

Mass concrete has been largely used in the construction of sewers of 4 ft. diameter and upwards. It is moulded in the trench, and supported by centering until set. Elliptical sewers are also constructed in this manner. In recent years reinforced concrete has been employed for sewers of both types, the mixture being sufficiently stiff to admit of ramming.

Concrete tubes have been extensively employed in main sewerage work for many years past, being supplied ready for use by firms who have taken up their manufacture.

Concrete tubes, unless strongly reinforced, should be laid on a concrete bed not less than 6 in. in thickness, and the concrete brought up round the tube as far as the springing. By the omission of this precaution many failures have occurred. In tubes liable to internal pressure the concrete should entirely surround them. The tubes have ogee, rebated joints which are luted with cement, and the inside pointed up.

Reinforced-concrete pipes have been used for water mains at Swansea against heads of 246 ft. and 500 ft., at Norwich for sewage rising main, head 131 ft., and at Clydebank for water, head 390 ft., and are about to be laid at Leeds for water. They have been largely used on the Continent, and 119 miles of 10-in. to 49-in. water mains were in course of construction in Flanders at the outbreak of the war. They have also been largely used in Paris. Twenty years since the municipality laid down 1 mile of 6-ft. diameter as a rising main for sewage head 115 ft., in a gallery alongside a steel riveted main of the same diameter. It has been found that the steel main requires considerable maintenance, and the concrete tube none. Concrete tubes are constructed to form manholes, water tanks and cesspits. Sewers, reservoirs, manholes, and so forth are constructed with moulded blocks of concrete which are supplied by various manufacturers.

As illustrating in greater detail the application of concrete to sanitation works, the author then described and illustrated the following examples: Failure and reconstruction of concrete-covered reservoir; temperature cracks in concrete reservoir wall; ejector chamber in concrete with steel-plate lining; concrete mole forming sewage outfall into sea; circular hydrolytic tanks in reinforced concrete.

At the end of the paper an illustrated appendix was given descriptive of the methods and manufacture of concrete tubes furnished by various firms specialising in such work.

DISCUSSION OF MR. TINGLE'S PAPER.

The President (Prof. Henry Adams) said he thought the paper was likely to be extremely useful to members engaged in municipal engineering. The author expressed the opinion that the concrete should be machine mixed. He would like to know whether Mr. Tingle was not in favour of batch-mixing as distinguished from continuous mixing. As to the test of the concrete tubes, most municipal engineers had been on the watch for experiments on the strength of pipes or sewers under load from above. It appeared that about 200 lb. per inch-run was sufficient to fracture the tube, but it must be remembered that in breaking it would not be short, unsupported lengths, but continuous. All experiments relating to this matter were of value, and a subject for investigation. The author referred to the vibratory movement as being useful in Jagger concrete tubes. He (the chairman) had had experience of the vibratory movement in connection with artificial paving, and it was found to be extremely useful in holding the material, and extended to stoneware for a longer period. The Bonna pipe was alluded to as exposed to currents of hot air, but his experience was that it required some protection from hot air. One would think it was rather sacrificing the strength of the pipes to shorten the time of their manufacture. With respect to Siegwart pipes, it might be asked why there should be a cruciform section. Personally, he preferred the simplest form, plain round or square; but, of course, there might be some reason for adopting the cruciform form. As to the failure of the reservoir, referred to by the author, they were not told where it was, or who was the

* Abstract of paper read at the last meeting of the Concrete Institute.

[illegible] gradually along so that the thrust was uniform. [illegible] cement and furnace slag, and the strong smell given [illegible] certain times, and it was found that furnace slag [illegible] to put down cast-iron tubing, and it could have been [illegible] turn of the tide. He agreed entirely with the chairman that the design of the reservoir described was such that it could not be otherwise than a failure. In forming the roofs of a reservoir it should not be forgotten that the covering was saturated with water, [illegible] away, with the result that a great weight was thrown [illegible] interested in the point brought out by the author with respect to the short term for which loans were [illegible] his experience it was intended to make use of rein- [illegible] found on the spot, and as only a fifteen years' term would be given it was decided, in the interests of the clients, to make use of mass concrete. There was a great deal of grumbling at the limitation of loans to ten or fifteen years in cases of concrete that came in contact with sewage, but a large factor of safety must be allowed, and he thought that the public authority had been quite right up to the present time. He would not say that in the near future they might not alter their views, but there was safety in going slow, and he expected that up to the present [illegible] thought they were justified in the stand they had made.

Prof. Stephen M. Dixon said there was [illegible] on which he would like further information, and that was the question of pipes under large pressure. How were the joints for those pipes made? There was sometimes a great deal of trouble through the percolation of water, and he would like to know if percolation had occurred in the cases mentioned by the author.

Mr. D. B. Butler remarked that as to the Local Government Board only allowing loans for ten years for reinforced concrete, and twenty years for ordinary concrete, Mr. Moss-Flower said they were right in going slow, and perhaps they were. If reinforced concrete was properly laid water could not attack it, and even if it did the lime compounds would act as a perfect preservative of the steel reinforcement. When properly made, even if the water got in it would become alkaline, and act as a preservative of the reinforcement. He thought it was rather a pity that the author had quoted tests which were more than thirty years old. He did not know whether these were the only tests available, but he thought it was rather misleading to give them, because cement had been vastly improved. The author suggested that English cement was not so good as that of Boulogne and Stettin, owing to internal control. He (Mr. Butler) had visited the works of Belgium and Germany, and he said without fear of contradiction that English cement nowadays was, if anything, superior to foreign cement, owing to the improvement of the English machinery. With respect to the reservoir which failed, he did not gather from the paper how much of the floor was covered with slag, and why. Slag contained a large amount of calcium sulphide, which gave out a smell of sulphuretted hydrogen. The speaker quoted the case of a sewer in connection with alkali works, the upper part of which was attacked by the gas given off from calcium sulphide. The result was that the concrete became thoroughly rotten, and the sewer had to be relaid altogether.

Mr. J. G. Sharp said he was all the more interested in the paper as concrete was quite the earliest material he ever had to deal with. It was quite true that concrete was not a new thing as applied to sanitation, but it was difficult to get engineers to take it up because of the cost. As to the Local Government Board's requirements, he could not help sharing the views of Mr. Moss-Flower. People said the War Department, the Board of Works, and the Admiralty used reinforced concrete, and why should not the [illegible] ment Board had to sanction the expenditure of money under the supervision of the local authorities, who were not essentially people of the wide experience whom the War Office and Admiralty could command. The officers of local authorities were not, in fact, as a rule, Westminster engineers. It was well known that concrete required most close supervision. Those who were making it constantly knew that the men must be closely looked after. Cement was a chemical article, and unless there was supervision at every [illegible] Unless a local authority which had received sanction to use reinforced concrete exercised the most careful supervision over the concrete, the concrete industry was likely to have a serious set-back. With reference to the old experiments quoted by the author, he took it that they were intended to show that the application of concrete to sanitation really dated back a large number of years. It was forty years since concrete tubes were introduced, and this fact was brought out by the experiments quoted. As to Stettin cement, he agreed with Mr. Butler that even in those days English cement was obtainable, and he was certain that nowadays it was quite impossible to beat English cement. He thought the Concrete Institute should endeavour to bring its views to bear upon the importance of fine grinding. Whatever standard specification was specified it required tightening up considerably, and it was economical to pay a little extra to get a more finely ground cement.

Mr. W. Campbell Sharman said much had been stated about cement, but little about the correct grading of the aggregate, which was almost more important than anything else with respect to concrete. He had great belief in a perfectly graded aggregate, but one was seldom able to get it. He had made experiments in which Leighton Buzzard sand and granite were used respectively, and the result seemed to prove that the aggregate was almost more important than the cement. He thought that more attention should be paid to this in the future than had been done in the past.

Mr. Allan Graham observed that the failure of the reservoirs would act as a good lesson for the future. With respect to the cruciform reinforcement, he took it that it was intended to hold the concrete in the right position between the longitudinal reinforcement.

Mr. Tingle, in reply to the discussion, said that when he used the term "machine-mixed" he meant lifted in batches; he did not mean continuously. The president also referred to his statement that, in some instances, artificial means were adopted to hasten the setting of the concrete while the tube was in the mould. That did not refer to the Bonna pipe. It was a general statement that, in some instances, concrete pipes were put under artificial means of drying in order to liberate the mould. With respect to the reservoir that failed, the area of the floor covered with furnace slag mixture would be about 20 ft. by 20 ft. It was really over a pothole of gravel under the concrete, and the pothole was 16 ft. in diameter. The concrete was not affected in other parts. Mr. Moss-Flower suggested that cast-iron tubing would be cheaper, but he (Mr. Tingle) did not think it would. Then he was asked how soon the tide followed on the laying of the concrete. They used to work until they were driven out by the water, and perhaps they could not go to that place to continue the work for two months. They could only work at spring tides. Then a question was asked how the joints were made in the pipes that stood the pressure at Norwich and Swansea. He referred them to the examples shown, and added that there was no percolation at all through the concrete if the pipe was properly made. His reference to the old tests was intended to show what was done in those days, and the difficulties that men who took up such work had to deal with.

THE ROAD BOARD.

GRANTS TO HIGHWAY AUTHORITIES: SEVENTEENTH LIST.

During the months of October, November and December, 1914, the Road Board indicated additional advances to highway authorities, amounting, in the aggregate, to £170,935, of which £132,833 was by way of grant, and £38,092 by way of loan.

The advances made and indicated up to December 31, 1914, less indications cancelled, amount to

County or County Borough.	Amount of grant for: Improvement of road-crusts.	Road widenings, corners and diversions.	New roads and bridges and reconstruction of bridges	Total.
ENGLAND.	£	£	£	£
Barnsley (C.B.)	—	100	—	100
Barrow-in-Furness (C.B.)	2,250	—	—	2,250
Berks	160	—	—	160
Bolton (C.B.)	—	—	250	250
Bristol (C.B.)	—	1,800	—	1,800
Cambridge	1,764	37	—	4,801
Cheshire	28	50	—	78
Cornwall	613	594	—	1,207
Cumberland	—	928	—	928
Derby	—	665	—	665
Devon	—	836	—	836
Essex	2,382	1,000	—	3,382
Grimsby (C.B.)	—	5,000	—	5,000
Hereford	15,350	—	—	15,350
Hertford	4,015	2,765	165	6,945
Hull (C.B.)	162	1,824	—	1,986
Isle of Ely	521	—	—	521
Kent	293	361	500	1,154
Lancashire	19,422	8,955	568	28,945
Leicester	—	2,332	—	2,332
Lincoln (C.B.)	—	738	1,270	2,008
Lincs (Lindsey)	—	107	—	107
London (Area of the Metropolitan Police District)*	31,710	21,469	—	56,179
Monmouth	—	3,488	—	3,488
Newcastle-upon-Tyne (C.B.)	—	5,000	—	5,000
Norfolk	3,455	—	—	3,455
Northampton	—	21	—	21
Nottingham	—	—	1,193	1,193
Reading (C.B.)	—	6,500	—	6,500
Salop	543	37	—	580
Smethwick (C.B.)	2,300	—	—	2,300
Somerset	100	—	—	100
Southampton (C.B.)	1,000	288	—	1,288
Staffs	19	—	—	19
Stockport (C.B.)	824	3,343	—	4,167
Suffolk (East)	31,000	—	—	31,000
Suffolk (West)	762	—	—	762
Surrey	28,301	215	1,012	29,528
Sussex (East)	212	—	—	212
Wilts	1,961	39	—	2,000
Worcester	1,149	—	—	1,149
Yorks (N.R.)	2,328	425	615	3,368
Yorks (W.R.)	—	1,500	—	1,500
Yarmouth (C.B.)	180	—	—	180
WALES.				
Anglesey	28	109	—	137
Brecon	792	35	—	827
Cardigan	2,460	38	—	2,498
Carnarvon	1,810	309	7,003	9,222
Denbigh	60	608	1,150	2,118
Glamorgan	—	8,826	12,801	21,627
Merioneth	—	5,061	—	5,061
SCOTLAND.				
Ayr	3,491	—	—	3,491
Banff	170	—	—	170
Berwick	70	—	—	70
Dumfries	70	—	—	70
Dumbarton	5,794	245	1,760	7,799
Elgin	1,491	—	—	1,491
Fife	150	—	—	150
Forfar	705	—	—	705
Haddington	300	—	—	300
Kincardine	54	—	—	54
Kirkcudbright	80	—	—	80
Lanark	—	—	2,000	2,000
Linlithgow	591	—	—	591
Peebles	4,000	—	—	4,000
Perth	100	—	—	100
Renfrew (Cromertyshire)	108	—	—	108
IRELAND.				
Antrim	1,022	1,175	—	2,197
Down	169	—	—	169
Galway	4,959	—	—	4,959
Kerry	27,000	—	—	27,000
Kilkenny	3,526	—	—	3,526
Kildare	591	—	—	591
Londonderry	595	—	—	595
Mayo	300	—	—	300
Meath	274	—	—	274
Queen's County	763	—	—	763
Roscommon	2,200	—	—	2,200

* Note.—This amount (£31,710) was made up as follows:—Richmond (Surrey), £1,017; Barnes, £1,011; Edmonton, £3,750; St. Pancras, £5,381; Southwark, £1,085; Wandsworth, £1,578; Tottenham, £8,284; Waltham Cross, £850; Watford, £1,000; Wimbledon, £4,250; Middlesex County Council, £10,542.

...,904,304. Of this total £1,508,585 is by way of grant, and £1,445,719 by way of loan.

The formal grants completed, with the approval of the Treasury, during the last quarter, amounting to £337,939, were applied as follows:—

Road crust improvements	£219,774
Road widenings and improvement of curves and corners	80,994
Road diversions	6,154
Reconstruction and improvement of bridges	4,620
New roads and bridges	26,467

ARMY OFFICERS' EXPENSES.

CHERTSEY OFFICIAL'S ALLOWANCE.

At the recent meeting of the Chertsey Rural District Council, points of considerable interest to surveyors were raised in connection with the war. The surveyor (Mr. H. Beeney) reported that he had offered his services as 1st Lieutenant in the 2nd London Sanitary Company, R.A.M.C., for immediate active service with the Expeditionary Force if required.

The Chairman (Mr. W. Shears): When will you want to go?

The surveyor said it was quite indefinite and uncertain when or if he would be called upon. He understood there was a dearth of officers for that particular work, and that being so he thought it was only his duty, as he was qualified for the position, to volunteer to go. He also wanted to know what the council would pay to his wife if he was called up.

Replying to the Rev. G. W. Grundy, Mr. Beeney said his pay would be 14s. daily, but it was common knowledge that expenses were so high that every penny was needed for one's personal requirements.

It was mentioned that no allowances were made for the wives and children of regular officers. Mr. F. W. Benham proposed that Mr. Beeney should receive full pay for three months, and that the matter should then be reviewed. This was seconded by Mr. E. Mears. Mr. F. J. McLennan moved as an amendment that half-pay be allowed, and the rent of Mr. Beeney's office be paid for three months, with review then. Captain G. E. Price seconded. The motion was carried by the chairman's casting vote, and was then unanimously agreed to.

The surveyor, therefore, will have his full salary of £250, but will have to pay the rent of an office for any new surveyor who may be appointed.

The Chairman inquired how Mr. Beeney's place could be filled until his return. Several members thought a retired surveyor would be willing to do the work; but the matter was left open for the present.

RELICS OF OLD SOUTHWARK BRIDGE.

Excavation in connection with the rebuilding of Southwark Bridge has (the *Globe* states) brought to light some interesting antiquities which were found in the old south pier. These include an inscribed plate of a kind of pewter, measuring 15½ in. by 12½ in., which was discovered under a layer of mortar on the top of the foundation-stone.

The inscription, which is clearly legible, says the stone was laid on May 23, 1815, by Admiral Lord Keith, and it concludes:—

> The work was commenced at the glorious termination of the longest and most expensive war in which the nation has ever been engaged.
>
> John Rennie, civil engineer.

Firmly encased in the actual foundation-stone a thick glass bottle was discovered. It contained a discoloured piece of parchment and fifteen Irish and English coins, the dates of which range from 1797 to 1814. They include a silver bank token of the value of 3s., and about equal in weight to half-a-crown.

Treatment of Artificial Stone. The architects to the staff institute belonging to Messrs. Swaine & Hunter, of Wallsend-on-Tyne, are having the artificial stone for this building treated with the powder "Pudlo." Apart from the waterproofing properties of the powder, it is reported to give artificial stone a bright and clean appearance, with sharp, clear-cut arrises. If this object can be attained, it is certainly more satisfactory than a non-Pudloed stone, which soon becomes rain-sodden and dirty.

LOCAL TAXATION RETURNS.

1911-12 FIGURES.

The summary and index of the Local Taxation Returns for 1911-12 have been issued as a Blue Book (price 1s. 3d.). The publication shows that local authorities in England and Wales received in 1911-12 from all sources, exclusive of loans, £150,285,000, the principal services of which being from public rates amounted to £66,500,000, and local lighting and transit undertakings (over £34,500,000).

The average amount of rates per head of the estimated population was, in London, £3 10s. 5d., and in the county boroughs £1 16s. 8d. In other urban areas the average amount of rates per head of the 1911 census population was £1 10s. 11d., and in rural areas £1 6s. 5d.

The expenditure of the local authorities during the year under review is given as £134,073,327, inclusive of loan charges amounting to £31,117,000. Among the items of expenditure were :—

Works and purposes.	Amount of expenditure.	Percentage of expenditure.
	£	
Baths, washhouses, and public bathing places	247,847	—
Cemeteries	723,456	—
Electric lighting (other than police)	4,118,421	3·1
Gas works	7,[illegible]	1
Harbours, docks, piers, and navigation	[illegible]	—
Highways, bridges, ferries, and highway rates (except the Highway Board)	[illegible]	11
Hospitals for infectious diseases (including Asylum Boards)	[illegible]	1·4
Lighting, &c.	1,861,[illegible]	1·4
Police, including pensions, clothing, and buildings	[illegible]	1·7
Public libraries, museums, and schools of art	[illegible]	·4
Lunatics and lunatic asylums	[illegible]	1·7
Lunatics not in lunatic asylums	[illegible]	·1
Markets	[illegible]	·1
Parks, pleasure grounds, and open spaces	1,[illegible]	·9
Police (not county)	[illegible]	1·3
Private street works and other works of private improvement	[illegible]	·4
Sewerage and sewage disposal	[illegible]	·6
Tramways and light railways	[illegible]	6·5
Vaccination	[illegible]	·01
Water works	[illegible]	1

It would appear from the entries in the foregoing table that, excluding expenditure defrayed out of loans, as compared with 1910-11, there was an increase of nearly £458,000 in respect of highways, bridges and ferries, an increase of £372,000 in respect of police and police [illegible], an increase of £[illegible] in respect of lunatics and lunatic asylums, and an increase of £49,000 in respect of sewerage and sewage disposal. Expenditure in respect of electricity supply undertakings increased by nearly £467,000; in respect of [illegible], dock, pier, canal and quay undertakings by

HIGHWAY MAINTENANCE AND REPAIRS: COST PER MILE.

Description of Road.	Gross expenditure (Receipts on account of roads deducted).	Mileage.	Average cost per mile, 1911-12.	Average cost per mile, 1910-11.
	£		£	£
Main roads repaired by county councils other than the London County Council.				
(i.) In urban districts	167,086	691	241	238
(ii.) In rural districts	1,770,942	18,071	98	88
Main roads repaired, or partly repaired by county councils, by contract				
(i.) Municipal boroughs (other than county boroughs)	284,957	1,242	229	227
(ii.) Urban districts (other than boroughs)	500,683	2,158	232	230
(iii.) Rural districts	130,828	1,602	81	81
Roads (not being main roads) repaired by councils of				
(i.) Municipal boroughs (other than county boroughs)	567,348	1,032	109	111
(ii.) Urban districts (other than boroughs)	978,195	11,871	82	85
(iii.) Rural districts	2,351,070	98,084	24	24
Public roads and streets prepared by				
(i.) Councils of county boroughs	1,297,194	9,567	136	137
(ii.) Councils of metropolitan boroughs	737,675	2,154	342	325
(iii.) Corporation of London	34,128	48	711	747

£300,000; in respect of tramways and light railways by £288,000; in respect of water supply undertakings by £130,000; and in respect of gas supply undertakings by £99,000.

The foregoing table shows, for the year covered by the report, the sums expended (otherwise than out of loans) by each class of local authority in England and Wales on the maintenance and repair of public roads, the mileage of such roads, and the average amount per mile of the sums so expended. Corresponding averages for the year 1910-11 are also given.

In addition, sums amounting to £11,582 were expended by parish councils and parish meetings in respect of footpaths and rights of way, and there was expenditure (not exceeding £13,000) by the London County Council on the maintenance and repair of the roadway of certain embankments and subways.

THINGS ONE WOULD LIKE TO KNOW.

(*Contributed.*)

Cannot the Smoke Abatement Society and others who have for so many years past been active in the abatement of the excessive smoke nuisance congratulate themselves that their labours have not been without definite result? Cannot everyone who has known London for the past twenty years say with truth that the old black fog, "the London Particular," as Dickens called it, has disappeared, and that this [illegible] and wasteful smoke? Should not this result be an encouragement to many of us who have for years past been trying to remedy some crying evil without yet perceiving any good resulting from our labours?

* * * *

Is it to be wondered at that tar-grouting, both single and double, has lately gone out of fashion, when we consider the number of failures there have been in this class of work? Is it not possible, however, that these failures are not due to the principle being wrong, but that they may have been caused either by want of skill in construction, economy in the quantity of grouting used, and the impossible conditions of the weather when the work was carried out?

* * * *

How long will it be before the Road Board give us a report on the experience they must by now have gained in the different descriptions of road construction which have now been adopted in this or other countries? Would not some report of this description be invaluable to all road makers?

* * * *

Are we likely ever to hear anything more of the scheme for bringing water into London from Wales? Does it not seem a pity that all the water now temporarily "stored" in the Thames Valley should be wasted? Is it not to be regretted in this connection that the Thames Valley is not of sufficient altitude to be of use in this respect, or that gravity cannot be [illegible]

* * * *

Is it a fact that many surveyors throughout the country are suffering from a lack of sufficient skilled labour for road maintenance and construction? Does this arise from the number of men who are enlisting in Kitchener's new army, or from the fact that the wages offered to roadmen are generally lower than those pertaining in the district for other classes of labour? Is it not perfectly true that the best materials may be wasted if handled by unskilled labour? When will those who are responsible for our roads realise that "mind and metal" are inseparable where good roads are required?

* * * *

Is it a fact that, although "best Wallsend coal" is still advertised by London coal merchants, not a single ton of coal from Wallsend has come to London for the last forty years? May we assume that this title is given to it on the same principle that all the best fowls come from Dorking, soles from Dover, oysters from Whitstable, hams from York, rabbits from Ostend, and pigeons from Bordeaux? As Shakespeare—or Bacon—said, "What's in a name?"

Cement Grouting.—Mr. A. Rothera, M.INST.C.E., engineer and surveyor to the Liversedge Urban District Council, desires information relating to contractors or others who possess a pressure cement-grouting machine who would be willing to quote for some work in Liversedge.

The Lateral Pressure and Resistance of Clay, and the Supporting Power of Clay Foundations.

By ARTHUR LANGTRY BELL. B.A., B.E., M.INST.C.E.

[The following is an abstract of a paper read at the meeting of the Institution of Civil Engineers on Tuesday evening last.]

This paper opens with a reference to the difficulty to be anticipated in attempting to estimate the lateral pressures and resistances of clay, its constitution and properties being obscure. It is pointed out that the engineer is not interested in the complex problems which attract the attention of the physicist, but would be content with a practical, simple, and sufficiently correct method of estimating the pressures and resistances exerted by clay, so far as these affect the design and stability of structures.

Published information is unfortunately insufficient to aid an engineer when confronted in practice with problems calling for a precise knowledge of the matter. He cannot hope to build a safe structure at the least cost unless he can make some reasonably accurate estimate of the forces with which he has to deal. Owing to reasons which appear later in the paper, the accepted theories of earth-pressure do not afford him much assistance.

There are two theories of earth-pressure ordinarily used in English practice—Coulomb's and Rankine's. Both these theories apply to "a loose granular mass"—a definition which cannot possibly include undisturbed clay. Both also presuppose a knowledge of the angle of repose. The text-books in current use give angles of repose for clay varying from 1 deg. to 45 deg., and observation of the material itself is of little value when selecting the angle to be used for calculations. Widely different results will be obtained according to the angles chosen. The results of calculations by these methods are also found to be at variance with observed facts.

In the author's view, the lack of agreement is due not so much to error in the existing theories as to a misapprehension as to the extent of their applicability. It is the purpose of the paper to bring before the members of the institution an extension or modification of Rankine's theory, which, when applied to clay, yields results more closely in accordance with fact and observation.

A short description is given of the monolith foundation work at Rosyth Dockyard, as it was in connection with this work that the investigation which forms the subject of the paper was made.

As the work of founding the monoliths proceeded, Rankine's formulæ were duly applied to the different cases which arose, but, in view of the doubt as to the applicability of the formulæ to clay, and as to the correctness of the assumed angles of repose, the results were regarded rather as aids to practical judgment than as actual and reliable solutions of the problem of stability.

A search through all available records did not yield much information of value or furnish a theory of clay pressure. Practical experience with tunnels and embankments appeared to indicate that the pressures exerted by clay resembled those due to a heavy fluid. This view is supported by a quotation which is made from a previous contribution by the late Sir George H. Darwin. The search revealed a high percentage of failures in work constructed in clay. The broad conclusions to which the investigation led were that there was no available theory of earth-pressure which, when applied to clay, would command the general confidence of engineers. There were no fixed rules of practice, and there were grave differences of opinion as to what intensities of pressure could safely be placed upon clay foundations.

Experiments were undertaken with a view to throwing further light upon the question. The first experiments described were made in a small testing cylinder 8 in. in diameter, fitted with gauges at the ends and sides. The results are given of a few tests with this apparatus, but the author does not regard them as having much value.

Up to this point, following established custom, it had been thought that, however difficult it might be to find the true angle of repose for clay, it might be possible by experiment, or as the result of experience, to hit upon an angle which, when introduced into the generally recognised formulæ would give correct results. Suspicions were now felt that the root of the difficulty lay deeper, and that the true reason why Rankine's and Coulomb's theories were not applicable to clay was because clay did not conform to the law of resistance to shear which forms the initial basis of both those theories.

Rankine expresses the primary law upon which his theory is based in the following words: "The resistance to displacement by sliding along a given plane in a loose granular mass is equal to the normal pressure exerted between the parts of the mass on either side of that plane multiplied by a specific constant."

The symbolical expression of this law is—

$$q = p_n \mu = p_n \tan \phi,$$

p_n representing the intensity of normal pressure on the plane of shear, and q the intensity of resistance to shear on the same plane. μ the "specific constant" is equal to tan ϕ, ϕ being the angle of repose.

If it could be shown that clay failed to comply with this primary condition, then it seemed clear that formulæ deduced from this condition were inapplicable to clay.

To carry out the desired tests another apparatus was made, consisting essentially of a vertical cylinder 3 in. in diameter and about 10 in. high. Fitting into the upper end was a plunger which could be weighted on top, so as to compress the clay placed within the cylinder below it. Arrangements were made whereby the clay (while under pressure in a vertical direction) could be sheared through horizontally. The vertical load upon the clay and the pull required to shear through the clay being both known and capable of variation at will, it is possible with this apparatus, by making successive tests with different specimens of the same clay placed under varying degrees of compressive stress, to determine the law which governs the relation between the ultimate shearing resistances and the normal pressures on the planes of shear.

Experiments made with sand gave results closely in accordance with Rankine's law as stated above. It was found that no kind of clay complied with this law. According to Rankine's law, where there is no pressure there is no resistance to shear, but in all cases clay was found to resist shear where the pressure was zero. The rate of increase of shearing resistance with advancing pressure was found not to be so great as would be inferred from Rankine's law, adopting the angles of repose ordinarily current in practice.

It was found that when plotted in diagram form (with equal horizontal and vertical scales) the results with clay could be represented, with reasonable accuracy, by straight lines. These lines did not, however, pass through the origin (as would be the case in material complying with Rankine's law). In all cases they cut the vertical axis which passes through the origin at a distance k from the origin, and with advancing pressure the resistance to shear increased in proportion to an angle α; α being the inclination of the straight line to the horizontal axis.

Stated symbolically, the law to which clay conformed—so far as its shearing properties were concerned—was found to be

$$q = k + p_n \tan \alpha$$

q representing the intensity of resistance to shear, p_n the intensity of normal pressure upon the plane of shear, and k the intensity of resistance to shear under zero pressure.

The law stated above becomes identical with Rankine's if k be taken as zero, and α as the angle of repose.

To make clear the state of stress and of resistance within a body subjected to external pressure, curves are shown illustrating the intensities of stress and resistance in sand and in clay. From these diagrams, and by a simple mathematical proof, it is shown where the plane of rupture occurs both in sand and

is 11s. The position of the plane of rupture ascertained in this manner is found to be identical with that deduced in a different way by Coulomb.

Having determined the position of the plane of rupture in clay, the author next proceeds, by considering the equilibrium of infinite number of cases of contact with the wall, to deduce formulæ for the pressure and resistance of clay. The formulæ are then compared with Rankine's in the following table:—

—	Rankine.	The Author.
p_1—intensity of active pressure on back of wall at any depth d	$= \left(\frac{1-\sin\phi}{1+\sin\phi}\right)$	$= k\cos^2\left(\frac{\pi}{4}-\frac{\alpha}{2}\right) - 2k\sin\left(\frac{\pi}{4}-\frac{\alpha}{2}\right)$
p_2—maximum intensity of horizontal resistance of material in front of a wall at any depth d	$= wd\left(\frac{1+\sin\phi}{1-\sin\phi}\right)$	$= wd\cos^2\left(\frac{\pi}{4}+\frac{\alpha}{2}\right) + 2k\sin\left(\frac{\pi}{4}+\frac{\alpha}{2}\right)$
p_3—minimum permissible intensity of downward pressure on foundation at heel of wall (depth H)	$= wH$	$= wH\cos^2\left(\frac{\pi}{4}-\frac{\alpha}{2}\right) - 2k\sin\left(\frac{\pi}{4}-\frac{\alpha}{2}\right)$
p_4—maximum permissible intensity of downward pressure on foundation at toe of wall (depth D)	$= wD\left(\frac{1+\sin\phi}{1-\sin\phi}\right)$	$= wD\cos^2\left(\frac{\pi}{4}+\frac{\alpha}{2}\right) - 2k\sin\left(\frac{\pi}{4}+\frac{\alpha}{2}\right)$

These formulæ suffice for the design of retaining walls in clay, the surfaces being assumed horizontal; the paper is limited to the consideration of this case only.

If k be taken as zero, and α equal to ϕ, the new formulæ (with one exception) become identical with Rankine's. The exception is the minimum permissible intensity upon a foundation—is then discussed, and reasons are given for adopting the newer formula. It is also pointed out that there is another essentially practical reason for the final abandonment of the value wH—namely, that, by what appears to be the general consent of engineers, it has, in fact, been already abandoned. It is questionable whether any large retaining wall has been built in accordance with it.

It was thought desirable to supplement the theoretical work by making direct observations of pressure within a large mass of clay. The four diaphragm gauges used in the previous cylinder tests were built into the side of one of the monoliths, being arranged in two pairs. The gauges of the lower pair were fixed side by side at a height of 10 ft. above the cutting edge of the monolith shoe, while directly above them, and 12 ft. 8 in. higher up, were the two remaining gauges. By adopting this arrangement it was intended that each gauge-reading should constitute a check upon the reading of that beside it, while the readings of the lower pair at any depth would be checked at a later date by those of the upper pair when the latter reached the same point.

The actual uncorrected readings of all four gauges, taken from time to time as opportunities offered during sinking, are shown by diagrams, together with a section of the strata through which the monolith was sunk.

Unfortunately, one pair of gauges was spoiled by leakage, and, owing to damage by blasting, the records obtained from the other pair were insufficient to confirm completely the theoretical conclusions previously obtained. But, so far as the records went, they appeared to be in reasonable conformity with the theoretical position discussed in the paper.

The laying of too much stress upon the few readings obtained is deprecated, and the practicability of making effective use of the new formulæ is discussed. It is pointed out that it is not easy, when designs are in progress, to obtain clay in its virgin state, and from considerable depths below the surface, for the purpose of making tests, and in certain methods of construction—the sinking of monoliths, for example—the strata are often never seen in their normal condition, even when the works are in progress. Further, the building of a new work may have, in the course of years, the effect of altering the condition of the strata which press upon the structure. What the extent of these changes will be, and whether they will be beneficial to stability or otherwise, will never be determinable by purely mathematical methods. If reasonably correct results are to be obtained, some measure of judgment must lend its aid towards the solution of the real problems of earth pressure which occur in practice, as distinguished from the simplified and somewhat unreal problems with which theorists necessarily deal.

The paper concludes with the usual formal acknowledgments, and a tabular statement of average values of k and α, so far as present experience goes. The appendices include an independent proof by Prof. Maurice F. Fitzgerald yielding results identical with those obtained by the author by different methods.

DIARIES AND CALENDARS.

One of the neatest desk calendars we have received is that issued by Messrs. Constable, Hart & Co., the well-known quarry owners and slag tar-macadam and tar-paving manufacturers, whose head office is at 41 Eastcheap, E.C. This contains date sheets for both this and next year, the whole being tastefully bound in dark green leather. A pocket diary and notebook accompanies the calendar.

A red leather pocket-book of excellent quality is being presented by the Dussek Bitumen Company, Bromley-by-Bow, E. This firm are, of course, the manufacturers of the "Trinidite" binder—a preparation which, they are careful to point out, is obtained solely from natural bitumen—and "Bitite," which is now being extensively employed for grouting granite setts, laying wood-block paving and surfacing, and sealing tar-macadam and all other bituminous roads. A detachable diary is provided with the pocket-book.

A Municipal Cinema. At a meeting of Pwllheli Town Council lately, the borough surveyor reported that the working of the cinema, which was taken over by the corporation some months ago, has been very satisfactory, and that a nett profit of £120 was made. The council decided to grant an honorarium to the surveyor for managing the pictures so successfully.

Early Street Lighting Troubles.—The *Times* quotes from its issue of January 10, 1815, the following paragraph: "The gas-lights in Fleet-street and Ludgate-hill were not lighted up yesterday evening, nor will they, until the latter end of the present week, owing to a branch now forming from the main pipe in Fleet-street to lead up Bridge-street. As reports have gone abroad to the prejudice of this undertaking, under Messrs. Grant, Hargrave and Knight, we are induced to state our belief that no exertion on their part has been spared to light up the district through which their pipes run. The apparent delay is, we are assured, ascribable entirely to those obstructions which are inseparable from the nature and extent of the works, and the number of workmen, of various callings, which are requisite."

LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

MEETING AT WIMBLEDON.

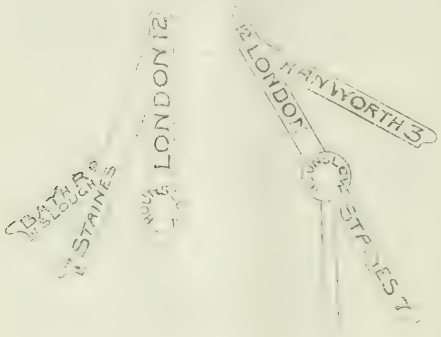
A meeting of the above-named body took place at Wimbledon on the 2nd inst., when, following a round of visits to the sewage works, cemetery extension, and Wandle Park open-air bath, the members assembled to listen to papers prepared by the borough engineer, Mr. C. H. Cooper, M.Inst.C.E. The company included Messrs. R. H. Jeffes (vice-president), who presided, H. T. Mather (Surbiton), F. R. Capon (Epsom), W. W. Gale (Carshalton), F. Wilkinson (Wimbledon), G. F. Carter (Croydon), S. H. Chambers (Hampton), M. Hainsworth (Teddington), F. W. Pearce (Twickenham), E. Willis (Chiswick), J. S. Crawshaw (Weybridge), E. Young Harrison (Guildford), J. A. Webb (Hendon), and J. G. Carey (Heston and Isleworth), hon. secretary and treasurer.

At the sewage works the visitors had explained to them the new method of treatment, of which some particulars were given in The Surveyor recently, and which was alluded to in the presidential address of Mr. A. P. I. Cotterell before the Institute of Sanitary Engineers last week [see p. 32 *ante*]. The process, which is being worked by the S.O.S. Company, has for its object the recovery of the valuable constituents of the sludge, for all of which, it is claimed, effective use can be found.

Following tea at Wandle Park House, Mr. Cooper submitted a paper on the question of

ROAD-DIRECTION SIGNS.

It was well said, remarked Mr. Cooper, that "Necessity is the mother of invention," and were it not that in the autumn of 1913 he found himself



Types of Mr. Cooper's Road-direction Signs.

beneath a burning cycle at a road junction, he would not have realised the necessity of a driver being acquainted with what he had to encounter at such a junction. There was only one way in which a driver unacquainted with the locality of which he was speaking could, before he reached the junction, acquire the knowledge to avoid such a mishap, and that was by reading a plan sign such as he proposed to describe.

On returning to Wimbledon Mr. Cooper prepared a model showing his system applied to the intersecting of two roads which consisted in placing a post with direction arms in each road approaching the junction at say 100 ft. back. The junction was reached, thereby enabling a driver to know which road he had to take in order that when he reached the junction his attention might be solely directed to the avoidance of oncoming traffic which, in the majority of cases, he could not see until the junction was reached. Junctions might therefore be taken as the points of greatest danger. It was at such points, however, that direction signs were placed in all the systems that had been considered.

When Mr. Joseph Bowen, one of Mr. Cooper's assistants, saw the model he suggested an essential improvement—namely, the placing of the direction arms in one place, facing the traffic approaching the junction, which (*a*) facilitated reading the writing on the arms, and (*b*) provided that the sign took the form of a semaphore plan of the junction, and set out that was most important for a driver to know—namely, the angles at which the various roads joined.

Mr. Cooper contended that none of the systems of direction signs which had been considered provided the following essentials for the safety of traffic which his own signs did—namely: (1) Supplying the driver approaching a junction with the direction of the road he had to take, &c., 100 ft. before he reached the junction; (2) allowing the driver to see a semaphore plan of the junction by which he was acquainted with angles at which the various roads joined; (3) lettering of sufficient size for the writing to be read at a distance of 200 ft., so that when travelling at 20 miles an hour seven seconds was provided in which to read the sign, and three and a-half seconds to consider how to negotiate the junction; (4) all working in one place facing the driver.

Mr. Cooper proceeded: "Like most good things, the system is costly, as a post and sign have to be placed in each road approaching a junction; whereas in the other systems one post sign suffices. . . . In no case can the arms be so placed on a single post as to be read from every direction. Many systems attempt to allow of this, but in such cases each arm cannot point direct to the road it refers to; and, further, the writing is distorted by arms being placed at an angle.

"A most important point is the system to be adopted as to the directions to be placed on an arm, bearing in mind that the writing has to be read at a distance of 200 ft., which necessitates 3-in. letters. The top line should be the name of the principal town to which the road leads, with its distance in miles or kilometres, the bottom line that of the nearest town or village. Thus, an arm at Hounslow directing to the Bath road should have: Bath 97; Slough 11.

"Except in special cases, no other information should appear. . . . The back of the boards are left blank.

"The signs as constructed in iron provide for the arms being threaded on a screen bolt between two boss plates, one being fixed to the post supporting the sign. The arms can thus be placed at the desired angles, and when placed in position are cemented together by a ring of composition. On being screwed home, the composition sets hard, and so excludes wet from entering the boss."

Mr. Cooper went on to suggest that, if plans of a junction as read from each road approaching were arranged on a post in the form of a lantern, so that the plans could be read from a distance of from 200 ft. to 300 ft., that would answer all the requirements met by the semaphore sign. By placing a light in the lantern, information would be afforded approaching traffic by night as well as by day. Unfortunately, plan reading was not sufficiently general; but he believed that in years to come such a sign would be insisted on, as it told the driver the full story of what he had to negotiate. No matter how intricate a junction might be, a semaphore plan, or, better still, an actual plan, showed what a driver had to negotiate in a way no other sign could do.

A number of lantern slides showing the application of the semaphore signs to various intersections were shown by the reader of the paper.

Mr. Cooper afterwards replied to a number of questions on points of detail raised by the members. Dealing with a suggestion of Mr. Willis that the posts should be placed further away from the intersections of roads than 100 ft., he pointed out that the principal thing to keep in view was the facility with which the signs could be read, and his object had been to enable that to be done in seven seconds. Where it happened that a vehicle was travelling fast, the result of any lessening of the distance he had proposed might be that, by the time the junction was reached the driver would have forgotten the direction he had to take. The vertical sign indicating a through road might present difficulties to those unaccustomed to reading such signs, but would be understood in the process of time.

A hearty vote of thanks was accorded to Mr. Cooper for his paper.

The Sheffield Corporation Tramways Bill.—The Parliamentary agents to the Corporation of Sheffield have deposited for next Session the Bill under which it is proposed to obtain power to acquire that part of the tramway constructed by the corporation of Rotherham within that part of the parish of Tinsley added to the city in 1911. The Bill also proposes to empower the corporation to expend £17,520 for the general purposes of their tramway undertaking.

Institute of Sanitary Engineers.

MR. A. P. I. COTTERELL'S PRESIDENTIAL ADDRESS.

(Conclusion.)

In the course of his recent presidential address to the members of the Institute of Sanitary Engineers, the major portion of which was reproduced in our issue of last week, Mr. A. P. I. Cotterell quoted from a report dealing with several towns in Lancashire and Cheshire a number of instances illustrating the conditions as regards housing that exist in portions of our urban and rural districts. He said:

I do not give these instances as exceptional. Probably they are no better and no worse than the average conditions of living and, and they certainly correspond with cases that I myself have come across.

We need not conclude that insanitary houses are always due to the neglect of an absentee landlord. It is far too often the small owner of the cottage occupied, who is also the owner whose property is in such a deplorable condition. The difficulty is intensified when such a cottage is both owned and occupied by a poor widow whose little all is in the property, and who really has not the means to carry out the necessary sanitary alterations.

As regards overcrowding or insufficiency of accommodation, it sometimes arises through the influx into the locality, either permanently or temporarily, of some of the better-class town dwellers who like to have a country cottage to retire to, but who do not realise that this makes one house the less for the indigenous population.

Any traveller by some of our main lines out of London looking through the windows must pity the circumstances of the dwellers in the mean streets and dirty courts that he passes. Something of the same kind of thing can be seen in many provincial towns where the railway runs in embankment or on viaduct. But it is not only the slum that excites the pity of the visitor. I was travelling the other day in South Wales with some Canadian colleagues. We passed through rows of modern terrace houses with backyards abutting on the line. The Canadians were not favourably impressed. The houses were of a far higher character than those I have described, but to their eyes they were far below what they ought to be, and not to be compared with the houses at Winnipeg, "where there was so much more room."

There are other problems mixed up with that of housing when the poorest poor are considered. There is the question of utterly insufficient wages to meet an economic rent, of inability to rise out of the slough in which they have lived so long, of want of resource, and of a love for a herded life in narrow courts or congested buildings.

A little time ago an investigation was made by Mrs. Pember Reeves on family life in some of the poorest districts of Lambeth. It is sorry reading to learn how these people struggle against almost overwhelming odds to keep a foothold on life. There are families getting less than £1 a week, who, when rent and similar outgoings are paid, have 3d. or 2d., or even less, per head per day to live upon. But one striking fact is noticeable—that those who pay more for a healthy dwelling, thereby involving sacrifice in food, are healthier, or at least rear their children better than those who adopt the opposite course. Some spend as much as 35 per cent., or even 45 per cent of their earnings in rent. What courage there must be among such people! How can they do it? And what must it mean when the cost of food goes up!

The able investigations carried out by Booth and Rowntree, and the noble lives lived by Octavia Hill and others like her, have probably done more than anything else to rouse the public conscience in the matter of urban housing. The nation had to do it when it came to know the facts. We can gladly acknowledge the efforts made by London and by many of our large cities to house some of their population under better conditions. Liverpool is shouldering a rate of 1½d. in the £ in order to house at rents of from 9½d. to 2s. 9d. per week people unhoused from insanitary areas who were utterly unable to rent a decent dwelling. The corporation declare that it pays them handsomely. Typhus has practically disappeared, the typhoid death-rate has fallen nearly 75 per cent in ten years, the mortality rate has been reduced from 50 to 27 per 1,000, public-houses have been swept away, and the police are losing their usual employment. Colonel Kyffin-Taylor, M.P., the chairman of the Corporation Housing Committee, says: "Some of the tenants in our buildings so improve their position that they ask for, and obtain, our better houses, and some get well-to-do and go further out into houses built by private enterprise. It is untrue to say that these people will make slums of any place they go to. It is easy for folk who live in charming houses, wear lovely clothes, and have lovely gardens to say that environment makes no difference. Liverpool says that in its experience that statement is wholly untrue. Fifteen years ago the people objected to being disturbed. Now some of them want to be disturbed, and are anxiously waiting their turn, and those whom we have rehoused have learned to realise and value their surroundings to such an extent that money that previously went in one direction has gone in another, and they have new aspirations, new ideas, new hopes."

There is one part of the United Kingdom where very notable progress has been made in housing. It is where, perhaps, one would least have expected to find it—viz., in the rural districts of Ireland. These changes have been brought about by a wise administration of the law under successive Ministries. From 1883 to the end of 1912 no less than 42,640 cottages were built by 211 out of the 213 rural district councils of Ireland at an average cost, including buildings, roads and land, of £185 per house, and containing usually one living-room and three bedrooms. Of the above number more than half have been erected since 1906. It has been possible to carry out this great work because the State undertook a substantial contribution towards the cost, amounting practically to 36 per cent, and the houses built can therefore be let at low rents within the compass of the wages of those who inhabit them. Not only so, but the working of the Land Purchase Acts has brought about great changes among the farming class. A recent holiday visit to the south-west of Ireland vividly impressed upon me the improvement in the well-being of the rural population. Again and again I passed a dwelling where the former house had been replaced by a new and substantial addition into which the pig was apparently no longer allowed to enter, but was relegated either to the ramshackle shanty alongside or to its own stye. It is not for me to enter into a discussion of the wisdom or otherwise of a procedure that involves a heavy subsidy from the State, but the effect in Co. Cork, where an exceptionally large number of houses have been built, does not seem disastrous, for, although wages have also increased from 30 to 50 per cent, the district generally is stated to be prospering.

In England changes are also taking place. The erection of better cottages in urban and rural districts and the development of estates to rehouse congested areas is also proceeding. I ask that it should not be allowed to slacken during this time of stress and of prodigal expenditure in other directions. The fact that immediately after the declaration of war an Act was passed through all its stages in one day providing for the issue of £4,000,000 for housing purposes, although not very much when compared with the huge sums now being spent by the nation, shows the importance attached by the Legislature to the subject.

COST OF BUILDING.

The cost of building naturally varies in different parts of the country, and according to the accommodation considered necessary. The houses already erected in districts in England that have undertaken housing appear to run from £300 to £160 per house. A concrete cottage exhibition held recently produced designs for buildings containing a living-room, scullery with offices, and three bedrooms for £125, exclusive of builder's profit, sanitary fittings, and drainage, fences or land, which, if added, would total up to

much the same outlay as ordinary buildings. I think, therefore, that we may take these as rock-bottom prices.

Under the favourable loan conditions hitherto allowed it has been found possible by local authorities to let houses of the values named at rents varying from 7s. to 5s. a week, and in a few cases rather less, before a point is reached where, as in Liverpool and in Ireland, a part of the rent has to be paid by others. These are lower rents than private enterprise can possibly afford to charge, even with land acquired on the same terms. The consequence must be that private house building for the poorer classes will tend to be cut out, and the onus of providing the necessary cottages will fall upon the local authority. An immediate consequence of this legislative change may easily be a shortage of houses and worse sanitary conditions unless localities are stirred up to undertake the duties now placed upon them by the State.

TOWN PLANNING.

I have not as yet mentioned town planning, but it is in this direction that I think we should look for an effective solution of the problem of housing. To some extent town planning is a revival of an art almost stamped out by the congestion that came with the commercial developments of the nineteenth century; but modern town planning can do more than its predecessor—it can introduce health as well as beauty. Some of our congested areas are past praying for, and the best thing we can do is to leave them to inevitable destruction while new and better conditions are started elsewhere. I think we not only need to regulate the housing of the workman, but we should also regulate the situation of the places where his work is done. There is a danger of factories crowding too much upon one another, quite as much as of people; let them be kept sufficiently far apart and the relief of human congestion will follow.

In these days of improved and improving traffic facilities the wider spacing of the country's workshops is not impossible. Hence I think that we can support the development of new suburbs, making them garden towns if you will, and design them for happier conditions than can ever be made of the old unhealthy areas. We can advocate also the grouping of our agricultural population in new and better cottages, so that life both in city and in country may be more like what it ought to be.

There is another feature of housing that must not be overlooked. The working man of to-day now needs, and is entitled to demand, better amenities and greater conveniences than were considered necessary forty or fifty years ago. He has been educated by order of the State, and his outlook on life has been completely altered thereby. All this has brought about a standard of comfort unknown to previous generations.

RENT AND WAGES.

Then, again, sanitary teaching pressed home year after year has made us to be a cleaner nation than we were. But cleanliness cannot be got for nothing; it costs to be clean. The mother who sewed her boy up for the winter did it with the object of economy as well as the man who, according to a well-known advertisement, omitted to use soap for quite two years. It is all right to provide greater cubic space, better windows, a bath, and other sanitary conveniences, but they not only affect the first cost, they increase the annual upkeep of the tenant.

Has the wage paid kept pace with the growth of requirement? Is it not a fact that the cost of housing alone, to say nothing of other things, has outstripped the wage paid to the householder? Should the workman still be expected to spend so large a proportion of his income on rent when his family has so many other needs to be satisfied before it can fulfil its duty to the State?

It may be said that these questions might have been answered a year ago, but now that the nation is struggling for its existence all such things have to be put aside. It would be a poor victory that succeeded in overcoming other nations but failed to maintain the vitality of our own. And this is recognised. While large sums are being poured out for the maintenance of the Navy and of the Army in the field, for the first time in our history, I believe, we are also caring for the wives and dependents at home. Steps have been taken and duties shouldered that cannot be entirely abandoned. It has been done because we know it is as true to-day as when Canning used the words 100 years ago—

> "Princes and Kings may flourish or may fade,
> A breath may blast them as a breath has made,
> But a bold peasantry our country's pride,
> When once destroyed can never be supplied."

We can therefore never be quite the same again. We have undertaken a responsibility towards one another that should not be entirely set aside. It is an outcome of the spirit of the age—a spirit that will continue after the responsibilities raised by the war shall have passed away.

Votes of thanks to Mr. Cotterell for his address, and to Mr. J. D. Watson, the retiring president, for his work during the past year, were passed with acclamation.

In responding, Mr. Watson referred to the prosperous year which had just come to an end, and the appreciable reduction in the debit balance as compared with the debit balance at the end of 1913. Mr. Watson suggested that it was more than probable that his successor in the chair would have greater difficulty in increasing the membership and the income of the institute than he had had. This, he pointed out, would be owing to war conditions, which necessarily made heavy demands upon the purses of all. That evening (Mr. Watson stated) he had dined with a member of council of a London club of which he was a member, who told him that, owing to resignations already sent in, voluntary remissions by the council of subscriptions due to the club by members who were on service, the payment of wages of servants who had gone to the Front, the wages of temporary men engaged to fill the places of those who had gone to the Front, and so forth, the club, it was estimated, would this year be involved in a loss of income equal to about £5,000. Clubs were not to be the only sufferers from our participation in the greatest war recorded in history. Institutions like theirs were sure to suffer in a similar manner, and it behoved all who had the welfare of the institute of Sanitary Engineers at heart to help the new president and his council to carry on the work with the utmost economy and circumspection. Mr. Watson, in commenting on the presence of a number of members of the 2nd London Sanitary Company of the R.A.M.C., congratulated their captain (Mr. A. J. Martin) on his promotion to the rank of major, and made reference to Major Martin's high ideals in relation to education in sanitary science, and the utility of sanitary companies as units of every army, and expressed the hope that his advance in rank would give him increased facilities for emphasising his advanced views in influential quarters. He wished, however, to draw attention to the wide difference between those ideals, which they all shared, and the immediate purpose of the War Office in sending sanitary companies into active service. He pointed out that it was misleading to call for trained engineers as recruits for those companies. The class of man the War Office needed to give effect to its purpose was the labourer and the navvy, as the work required of them was the most menial that could be imagined. Unless in exceptional cases, it was unlikely that the men would be called upon to superintend or direct the work of scavenging camps; but they would be called upon to do the scavenging themselves—most necessary work, no doubt—and he gave all honour to those who did it; indeed he was lost in admiration of the brave, self-sacrificing men who knowingly undertook it for love of country; but it was surely not work for highly educated men. Only that morning he had received a letter from a young friend of his, a Master of Science, an associate-member of the Institution of Civil Engineers, and a Fellow of the Geological and other learned Societies, thanking him (Mr. Watson) for preventing him from joining the 2nd London Sanitary Company, which he stated he would have done had it not been for his plain speaking. The work which the War Office had in view for the sanitary companies was necessary—indeed, there could be no better for the maintenance of the health of the troops—but there should be no misapprehension in the minds of recruits as to its nature, and any attempt to enlist men of education was like putting round men into square holes, and it was, moreover, a deliberate waste of skilled material which the country could ill afford at the present time.

Coventry's Growth.—More than 2 miles of new streets were taken over by Coventry Corporation last year, and plans for 1,189 new houses were approved.

The Surveyor
And Municipal and County Engineer.

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NOTTS COUNTY SURVEYORSHIP.

RESIGNATION OF MR. E. P. HOOLEY.

Mr. E. Purcell Hooley, M.Inst.C.E., who has occupied the position of county surveyor for Notts since 1890, and is well-known throughout the world over, we are sorry to learn, has tendered his resignation, and the matter is being considered by the Highways Committee of the county council. Mr. Hooley has accepted a commission with the 8th Sherwood Foresters, Reserve Battalion, stationed at Newark, and this is doubtless primarily the reason for his retirement, which has been received with considerable regret in the county.

Mr. Hooley was appointed to the position of county surveyor in 1890 out of nearly 160 candidates, and his professional activities have been continuous ever since. He has been a warm advocate of direct maintenance of main roads, and has had all the main roads of Notts, excepting those claimed under Section II. of the Act of 1888, in urban districts, under his management. His services as an expert have been sought in almost every main roads case, either in the Law Courts or before inspectors of the Local Government Board, within the last seventeen years. With his then chief assistant, Mr. J. Sander, he designed and built the new county asylum for Notts, and he has been engaged on many engineering schemes of railway and water developments affecting the county of Notts.

Mr. J. C. Haller, the assistant surveyor, has been temporarily appointed as county surveyor, and it is understood that the Highways Committee will take steps to fill the vacancy.

Tar-spraying and Horses.—At the meeting on Wednesday of the West Riding County Council the chairman of the Highways Committee promised to give consideration to a suggestion by a member that, in the tar-spraying of roads, a space of 5 ft. should be allowed on each side of the spray for the benefit of the horses.

Lostwithiel Borough Surveyor and Sunday Work.—At a meeting recently of the Lostwithiel Town Council the borough surveyor, Mr. J. Knight, was asked to prepare a revised plan for the rebuilding of Victoria-place. He replied that he had not got the time. He had to work on Sundays now. The mayor, Mr. J. H. Jeffrey, said that if the borough surveyor had to work on Sundays he should complain to the council. He was sorry to hear any public official say that he had to work Sundays.

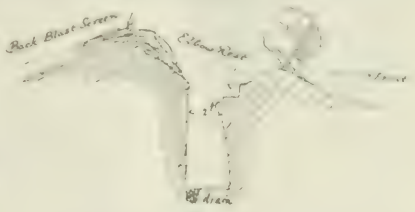
CORRESPONDENCE.

[illegible]

EARTHWORKS.

To the Editor of THE SURVEYOR.

SIR,—In his interesting paper upon "Earthworks" in your issue of the 8th inst., Mr. Hartfree suggests the use of certain obstacles—among others, tarred straw and leaves. May I mention that dead gorse passed through a chaff-cutter and sprinkled over the ground is an excellent deterrent both to two-footed and four-footed vermin? Further, it is often easily obtainable, and a chaff-cutter can generally be obtained from a neighbouring farmhouse. Chopped gorse is an old keeper's remedy for poachers using nets, as it rolls the nets into a rope in a very few



minutes. The accompanying rough sketch of a fire trench may be of interest to Mr. Hartfree; the original idea was explained to me by a military friend some weeks ago.

It appears that the "back-blast" of the enemy's shells falling to the rear of the trenches has caused many double ruptures to the men in front in the trenches. The high mounds to the rear of the trenches are for the purpose of deflecting the blast over the heads of the defenders of the trench.—Yours, &c.,

G. BERTRAM KERSHAW, M.AM.SOC.C.E., &c.

9 Victoria-street,
Westminster, S.W.
January 9, 1915.

SURVEYORS' SALARIES.

To the Editor of THE SURVEYOR.

SIR,—Your contributor of "Things One Would Like to Know" has evidently not studied what the effect would be if his recommendation of £20 to £1,000 of population were carried into effect. Under such a scheme the surveyor of Bexhill would get only £300 a year while the surveyor of Leeds would be entitled to £8,900 a year, and the surveyor of Liverpool about £15,000 a year. Although there may be officials in this country receiving salaries as big as this, it is doubtful if municipal authorities could be found capable of rising to the occasion.

May I suggest to your contributor to try rateable value?—though even then he would fail. I don't think any scale can be found to fit all cases.—Yours, &c.,

CONSTANT READER.

January 12, 1915.

To the Editor of THE SURVEYOR.

SIR,—In your issue of January 1st the writer of the bright "Things One Would Like to Know" asks for opinions as to basing the pay of surveyors on the populations of their districts, and as to how £20 per annum per thousand would work out. Well, I should say hopelessly badly. To take one instance. The urban district council of Ruislip-Northwood, in Middlesex, governs a population of some 7,000, which would give the professional man who acts as its engineer the clerkly wage of £140! No, Sir, this wouldn't do, nor, I think, would this idea work as a general principle, even if it were qualified with a compulsory *minimum*, of, say, £200 a year. There is no real relation between population and the engineering skill and work necessitated, but the arguments *pro* and *con* are too long to enter upon here.—Yours, &c.,

THE OLD SCREW.

January 11, 1915.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions: -

450. Masonry Dam. The inner face of a masonry dam is a plane vertical surface 12 ft. in height. The section of the dam is a right-angled triangle, 9 ft. wide at the base, and the weight of the masonry is 125 lb. per cubic foot. When the reservoir is filled to the upper edge of the dam, find the point at which the resultant pressure intersects the base. (A.M.I.C.E.)

451. Hydraulics.—Sketch a practical form of hydraulic ram for raising automatically to a considerable height a portion of any volume of water derived from a lesser height, and explain the points upon which satisfactory working depends.

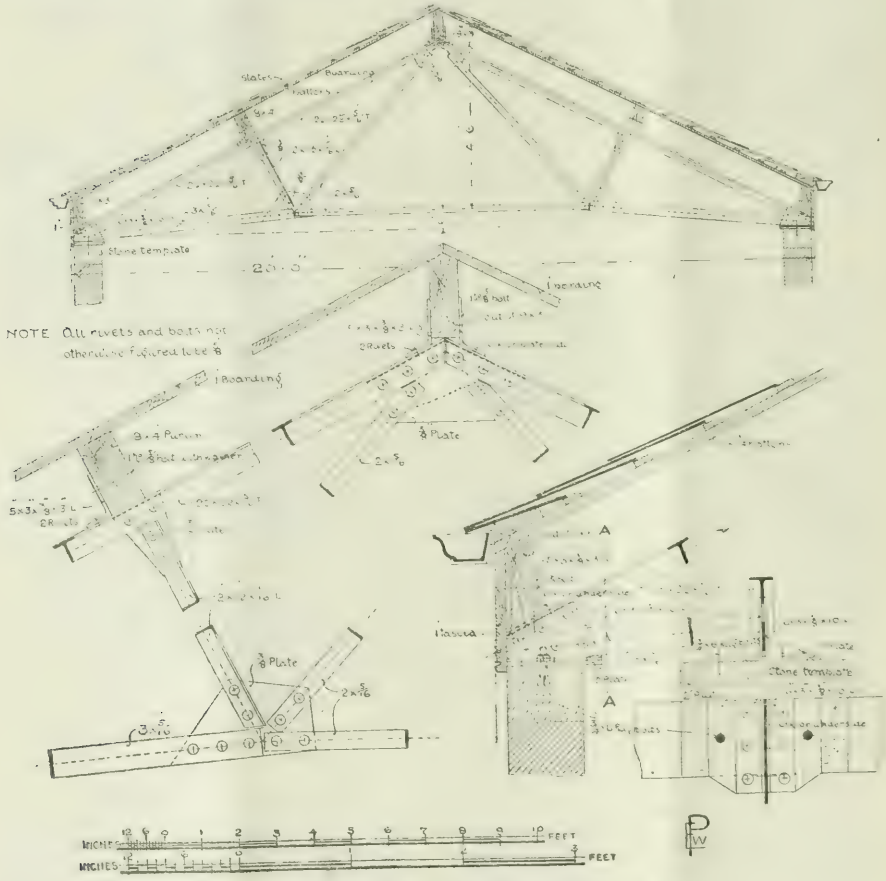
452. Wells.—What are—(1) A deep well, (2) a shallow well, (3) an artesian well, and (4) an Abyssinian well? Give definitions. (G. C., *Wigston Magna*.)

453. Building Construction.—Draw a section showing the construction of a flat asphalted roof, carried on timber joists 10 in. by 2½ in., ceiled below, the walls to be of 14 in. brickwork, [illegible] 9-in. parapet, 2 ft. high, coped with stones, the section to run across the joists and through the parapet walls. ("Ajax.")

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

449. Roof Truss.—Sketch a light iron roof truss for a span of 20 ft., and give enlarged details of the joints.



Steel Roof Truss: 10-ft. Centres
(Reply to Question 449.)

(E. W. P., *Southampton.*)

445. Cement Testing.—Sketch and describe the apparatus necessary for conducting the bushel weight and specific gravity tests for Portland cement.

It is often specified that cement shall weigh 112 lb. to 115 lb. per bushel. It is better practice to specify that the cement shall have a definite "specific gravity," the value being 3·10. Cement which has been imperfectly burned, or which has deteriorated through exposure to the atmosphere, and thus lost its power of combining with water,

[illegible] to have a specific gravity smaller than that of good cement. It is, however, questionable whether the specific gravity test is an indication of proper calcination.

The specific gravity [illegible]

$$\frac{\text{Weight of a given volume of cement}}{\text{Weight of same volume of water}}$$

or, more simply, [illegible]

$$\frac{\text{Weight of cement in grammes}}{\text{Volume of displacement in cubic centimetres}}$$

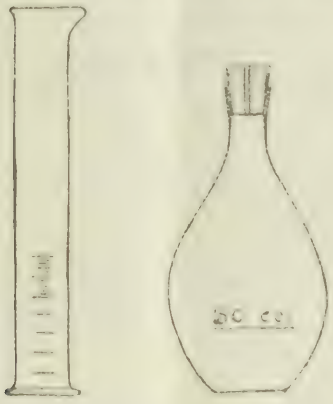


FIG. *a*. FIG. *b*.

The specific gravity may also be ascertained by means of a specific gravity bottle, which consists, as a rule, of a 50 cubic centimetres when filled to the [illegible] as in the illustration (see Fig. *b*). Weigh the bottle and stopper, then add a quantity of cement and weigh again. The difference gives the weight of cement added. Fill the bottle with water and replace the stopper so that the [illegible] cubic centimetres, and weigh again.

Subtract the weight of the bottle and cement. This gives the weight of water added in grammes, also the volume in cubic centimetres. The volume of cement is thus—50 cubic centimetres minus the volume of water added.

The specific gravity equals

$$\frac{\text{Weight of cement (grammes)}}{\text{Volume of cement (cubic centimetres)}}$$

W. R. H., *Waltham Cross*.

PROFESSIONAL MEN AND THE WAR.

WAR OFFICE STATEMENT.

The Secretary of the War Office announces that owing to the very great number of offers of assistance and applications for employment received from civil and mechanical engineers, architects, and surveyors, it has been found impossible to acknowledge letters individually.

Should an opportunity arise for utilising the services of any applicants, they will be communicated with, but the number of applications received far exceeds the probable requirements.

Whitby Spa Purchase.—In the course of the last meeting of the Whitby Urban Council a letter was read giving the Local Government Board's sanction to the borrowing of money for the purchase of the West Cliff Spa grounds and buildings, and notifying that an inquiry would be held on the 14th inst. into the council's application to borrow a further £10,650 for the development and improvement of the grounds and buildings.

PRO PATRIA.

[EIGHTEENTH LIST.]

We present herewith the eighteenth list of municipal engineering and sanitary officials who are to take part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

[illegible] Dr. J. [illegible] Sanitary Inspector, Newcastle-upon-Tyne, [illegible] Division.

Attwell, P., clerk, sanitary department, Kettering Urban District Council, 2nd Lieutenant, Army Service Company, R.A.M.C.

Bird, C. W., second assistant surveyor, Kettering Urban District Council, 7th Battalion Northamptonshire Regiment.

Bond, G., pupil, surveyor's department, Kettering, trooper, Northamptonshire Yeomanry.

Callis, clerk, Kettering Urban District Council, Northamptonshire Regiment.

Dunbavand, Eustace, borough surveyor's department, West Hartlepool, Second Lieutenant, R.E.

Firth, Chas., borough engineer and surveyor's department, Hampstead, sergeant, 1st London.

Kennedy, T. A., assistant surveyor, Redcar Urban District Council, Northumberland Divisional Cycling Company, No. 6 Platoon, for active service.

Lyles, C., assistant, rate collector's department, Kettering, 5th Battalion, Northamptonshire Regiment.

McRae, F. N., borough engineer and surveyor's department, Hampstead, sergeant, City of London.

Palmer, J. C., assistant sanitary inspector, Kettering, corporal, 9th Battalion East Surrey Regiment.

Percival, S. C., chief assistant, county architectural department, Northants, Sub-Lieutenant, 7th Northants Regiment.

Pilling, E., chief assistant, surveyor's department, Lytham Urban District Council, 7th Battalion, Manchester Regiment, Territorials.

Willett, Hugh, chief assistant, county roads and bridges department, Northants, corporal, 7th Northants Regiment (Lord Kitchener's Army).

Williams, D., borough engineer and surveyor's department, Hampstead, [illegible] company, R.A.M.C.

Mr. [illegible] Mayne and Elliott, [illegible] county surveyor of Northants, who was formerly a member of the firm, left this week for Singapore to take up an appointment as assistant on the Tebrau estates, Johore (Malay States), and joined King Edward's Colonial Horse, [illegible] 7,000 miles to fight [illegible]

ASSOCIATION OF SOMERSET SURVEYORS.

ANNUAL GENERAL MEETING.

The annual general meeting of the Association of Somerset Surveyors will be held at the Merchant Venturers' College, Bristol, on the 23rd inst., when the following business will be transacted: (1) The election of president and officers for the ensuing year; (2) to ballot for the election of members on the Executive Committee; (3) president's address; (4) presentation of premiums; (5) any other business.

The president-elect—Mr. F. W. Jones, ASSOC.M. INST.C.E., engineer and surveyor, Frome—invites all members to tea at the conclusion of the business. Subsequently, a short convivial gathering will take place, and all members are requested to assist in this direction.

Water Supply at Reading.—In its review of local activities during 1914 the *Reading Observer* notes that the Candy installation of filters at the Southcote works of the Reading Corporation waterworks continues to be visited by engineers from all parts of the country, adding that a further testimony to the efficiency of the system is that the War Office have recently adopted it for the purification of the water supply to the troops encamped on Salisbury Plain. Mr. H. G. Dadley and Mr. Bryne, members of the staff of the waterworks manager and engineer, Mr. Leslie Walker, have joined the army, and are now in France, the first named in the Royal Flying Corps, and his colleague in the Army Ordnance Corps.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Cowes U.D.C. (December 29th. Mr. P. M. Crosthwaite). £4,000 for a scheme of water supply.—It was stated that the proposed works included the following items: Cornish boiler, 24 ft. long by 5 ft. 6 in. in diameter, including provision of new foundations, £520; horizontal compound surface condensing engine, £850; one set of 10-in. treble well pumps, including gun-metal buckets and foot valves, steel standpipes, girders, and fixing complete, £1,920; alterations to top of well shaft, foundations for engine condenser pit, &c., £210; electric lighting plant for engine house and well work, including wiring, £150; 280 lin. yds. 8-in. water main for No. 4 reservoir to filter-house in Newport-road, £155; contingencies, £195; total, £4,000. Mr. Damant said that No. 1 plant yielded 8,000 gallons per hour, and No. 2 plant 25,000 gallons per hour. The surveyor, Mr. J. W. Webster, in submitting the details, stated that No. 2 plant had been running night and day for the last ten years, and had given great satisfaction. No. 1 plant was of weak design and construction, and it could not be relied upon. The nominal capacity was 10,000 gallons, but it was difficult to keep it running at 8,000. Plant No. 2 lifted 25,000 gallons per hour, and the proposed new machinery was estimated to lift 18,000 gallons. He considered it was necessary to get this plant at work by the end of June.

Rotherham R.D.C. (December 31st. Mr. A. W. Brightmore).—£862 for sewerage purposes, and £655 for water supply in the parishes of Brampton-en-le-Morthen and Laughton-en-le-Morthen.—Mr. J. H. Pickford, on behalf of the council, stated that it was proposed to lay a sewer in the parish of Laughton that would also serve the parish of Brampton-en-le-Morthen. This work was necessitated by the erection of property. Two other lengths of sewer were to be laid in Ridding's-lane, Laughton, for prospective buildings on the east side of the colliery company's cottages in the new village. A further sewer was projected in Catherine-street, rendered necessary by reason of the schools. Regarding the water mains, the conditions were precisely similar. The inspector held an inquiry on the following day into an application by the same council for sanction to a loan of £353 for sanitary improvements at Maltby. Replying to an objection that there was an insufficient supply of water at the present time, Mr. Pickford said it was understood a reservoir was about to be constructed, and this would probably improve matters.

York T.C. (January 5th. Mr. H. R. Hooper).—£19,000 for the electricity undertaking, to be allocated as follows: £11,400 for mains; £1,700 for services; £800 motors, £500 buildings for sub-generating station, £4,400 for plant, and £750 for transformers.—The town clerk, Mr. P. J. Spalding, said the council would like twenty-five years for the repayment of the amount borrowed for the buildings. The inspector: That means that every £1,000 borrowed costs you £2,500 before it is paid off. A shorter period is better, so as to get rid of paying interest as soon as you can for the benefit of the undertaking. What have you got to reserve fund? The city treasurer: Practically only £55. We have been paying off several items out of the reserve fund; for renewals, and so on, in the last years we have spent £7,000. The inspector: But out of that you have scrapped a lot of plant, it doesn't add to the assets to take it from the reserve. What have you done with the profits of last year, which were about £800? The city treasurer: We brought forward a surplus balance of £1,785, and with the year's profits it gave us a total of £2,867, and out of that we paid an outstanding liability of £2,812. The inspector: So really you have got no money at all. You hope, apparently, that everything will go on normally until you have got something. Fifty-five pounds is practically nothing on a capital of £200,000. The city treasurer replied that the sinking fund was very heavy; they were paying over £12,000 a year.

APPLICATIONS FOR LOANS.

Aldershot U.D.C.—£800 for workmen's dwellings.

Ashton-under-Lyne T.C. £20,400 for a secondary school.

Clacton U.D.C.—£1,205 for a new battery for the electricity works.

Darlington T.C.—£18,500 for new electrical plant.

Doncaster R.D.C.—£1,063 for the Askern sewage disposal scheme, and £3,000 for sewage disposal at Barmborough.

East Stow R.D.C.—£1,188 for the erection of three pairs of cottages.

Harrogate T.C.—£1,000 for the electricity undertaking.

Limerick T.C.—£5,000 for additional electrical plant and machinery.

Lower Bebington U.D.C.—£350 for public conveniences.

Swansea R.D.C.—£900 for works of sewage disposal.

Swindon T.C.—£2,640 for new trunk water mains.

Taunton T.C.—£3,450 for the erection of public baths.

Wakefield T.C.—£3,295 for the Westgate improvement.

LOANS SANCTIONED.

Arnold U.D.C.—£3,700 for the purchase of a site for a public park.

Barnet R.D.C.—£4,907 for the provision of workmen's cottages.

Broadstairs U.D.C.—£280 for drainage works.

Kirkby-in-Ashfield U.D.C.—£5,500 for a gasholder.

Romford U.D.C.—£11,288 for wood paving, £9,616 for foundations, setts, and kerbing, and £4,184 for sewerage works.

Runcorn U.D.C.—£270 for making up a road.

Wanstead U.D.C.—£580 for erecting a cottage and making an approach road to the isolation hospital.

Waterford T.C.—£23,138 for a housing scheme.

Wigan T.C.—£2,000 for conversions to the water-carriage system.

Wokingham T.C.—£3,150 for the gas undertaking.

Wolverhampton T.C. — £12,031 for workmen's dwellings.

Wrexham R.D.C.—£11,000 for the erection of houses at Rhos.

FORTHCOMING INQUIRIES.

JANUARY.

	£
19.—**Braintree.** For the erection of houses (Mr. C. H. Eyles)	650
19.—**Colwyn Bay.** For works of sewage disposal (Mr. A. G. Drury)	11,000
19.—**Wellington.** For works of sewage disposal (Mr. F. O. Stanford)	9,625
20.—**Eye.** For the erection of houses (Mr. C. H. Eyles)	650
20.—**Knottingley.** For works of sewerage (Major J. Stewart)	663
20.—**Oldbury.** For sewerage works (Mr. F. O. Stanford)	1,575
21. **Hyde.** For the purposes of the park and sewerage (Major J. Stewart)	2,855
21.—**Kidderminster.** For works of sewage disposal (Mr. F. O. Stanford)	31,000
21.—**Luton.** For the erection of houses (Mr. C. H. Eyles)	1,300
22.—**Droylsden.** For private street improvement (Major J. Stewart)	1,101
22. **New Malden.** For private street improvement (Mr. M. K. North) ...	1,600
22.—**Stratford-upon-Avon.** For the purpose of the gasworks (Mr. F. O. Stanford)	1,700

TOWN PLANNING.

JANUARY.

	£
27.—**Wrexham.** (Mr. Raymond Unwin) ...	—

FEBRUARY.

11. **Colne.** (Mr. Raymond Unwin) . ..	—
11.—**Newport (Mon.).** (Mr. Raymond Unwin)	—

London Lighting.—It is estimated by the St. Marylebone Electricity Department that, as a result of the street lighting restrictions, the output at their works is less by 10 per cent to 20 per cent per day.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear in the Buildings, Barrow Rail, Bradford Notice St., Sowerby Bridge, Sanitary and Town Planning, Wakefield, roads and materials, Lancaster, Norwich, Harrogate, sewerage and sewage disposal, New Mill, water, gas and electricity, Greenock, Lanchester. Particulars of other projected works will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Banbury T.C. It has been decided to carry out alterations to the town hall at an estimated cost of £900.

Barrow T.C. It was reported on Monday that the Carnegie Trustees had agreed to increase their gift of £12,000 to £15,000 for a new free library, and the donors were cordially thanked for their handsome gift.

Bath T.C.—The question of making alterations at the bathing establishment is under consideration. The estimated cost of the proposed works is £20,000.

Bradford T.C.—It is intended to provide public baths at Five Lane Ends, at an estimated cost of £9,762.

Doncaster T.C. Plans are being prepared for a police station and mortuary at Balby.

Essex C.C. Revised plans have been approved for extensions to the sanatorium at Black Notley, which are estimated to cost £1,500.

Hull T.C.—The Bridges Committee last week resolved to postpone for three months any further progress with the scheme for rebuilding the North Bridge.

Nelson T.C.—An amended scheme for public abattoirs has been approved.

Sheffield T.C.—The Watch Committee recommend the council to apply for sanction to borrow £4,067 for the extension of the chief fire station in Rockingham-street.

Sowerby Bridge U.D.C.—Plans have been approved for rebuilding the public baths at an estimated cost of nearly £5,000.

Surbiton U.D.C.—The council on Monday accepted the tender, the lowest of ten, of Messrs. Myall Brothers, Southend-on-Sea, at £2,021, for the erection of the chapel, lodge, office, &c., at the new cemetery. This sum includes £39 extra for terra-cotta instead of Bath stone, Mr. Bannan, the architect, considering that the latter might be affected by fumes from the destructor chimney.

Taunton T.C.—The borough surveyor, Mr. D. Edwards, has prepared a scheme for the provision of public baths, at an estimated cost of £3,450, including the cost of the site.

Warrington T.C.—The borough surveyor, Mr. A. M. Ker, has received instructions to prepare plans and estimates for an isolation hospital at Pear Tree Farm.

HOUSING AND TOWN PLANNING.

Ballycastle R.D.C—A letter has been received from the Local Government Board urging the council to deal with the insanitary areas of the town.

Bangor T.C.—It has been decided to purchase land from the Penrhyn estate at 4s. per square yard for the purpose of erecting additional workmen's dwellings.

Brixham U.D.C.—The Public Works Loan Commissioners have granted a loan of £3,810 for carrying out the housing scheme, to be repaid with interest at 4 per cent per annum, by half-yearly instalments, in sixty years, as regards £3,410, and eighty years for the remaining £400.

Ludlow T.C.—The Local Government Board have approved the council's housing scheme with a few alterations, and recommend that the building of twenty-two houses should be proceeded with.

Wednesbury T.C.—The council on Monday resolved to erect forty-eight working-class houses, and to apply to the Local Government Board for a loan of £10,200 to meet the cost of the scheme. The houses will have two rooms downstairs, and three bedrooms, and each tenement will have garden ground extending back 45 yds. The houses will be built in pairs with varying elevations, and they are to be let at 5s. 3d. a week.

REFUSE COLLECTION AND DISPOSAL.

Fowey T.C.—It has been resolved to terminate the agreement with the scavenging contractor, and to consider the question of doing the work by direct labour.

ROADS AND MATERIALS.

Bermondsey B.C. Arrangements are completed with the London County Council for the reconstruction of the tramway from Grange-road to Rotherhithe New-road. It is estimated that the cost of the tramway work alone will amount to £74,700. Of this sum £62,500 will be expended on trackwork, the cost of additional cars will amount to £6,650, the cables and ducts will cost £5,450, and additional plant at the sub-station will cost £100.

Blackburn T.C.—Plans have been approved for a number of new streets.

Carshalton U.D.C. Tenders are being invited for making up a number of new streets.

East Grinstead U.D.C.—The surveyor, Mr. W. E. Woollam, has received instructions to prepare plans, specifications, and apportionments for making up a number of roads in Park-road district.

Fifeshire C.C. A sub-committee of the County District Committee have recommended that with the object of carrying out in a more improved and economical manner the surface improvements, for which a grant of £7,000 has been made, the committee should purchase tar-mixing and road-rolling plant, consisting of a Koehring tar mixer, three tanks and sprayers, and a workmen's van, the total cost being £1,440.

Grimsby T.C.—The legal difficulties in connection with the Weelsby-road improvement scheme have been satisfactorily overcome, and the work will be put in hand as soon as possible.

Limerick T.C. In order to provide work for the unemployed the council have resolved to apply to the bank for a loan of £7,150 for completing the block paving of the streets.

Little Lever U.D.C.—The council are giving consideration to a scheme for the provision of a new main road from Bury-road, Ainsworth, through Little Lever and across the valley to Moses Gate.

Lostwithiel T.C.—The County Main Roads Committee having intimated that they were prepared to consider plans for widening the approaches to the town, the Street Committee recommended the taking off of the dangerous corner at the foot of St. Austell-road.

Marlborough T.C.—An additional estimate of £664 has been agreed to for granite for the London to Bristol main road.

Newcastle (Ireland) R.D.C.—The council have agreed to a proposal to construct about 8 miles of new road between Cushendun and Ballycastle, at an estimated cost of £11,000. It is hoped to obtain the greater part of the money from the Road Board and the county council.

Newhaven U.D.C.—The tender of Mr. W. J. Burstow, Brighton, at 6.365 has been accepted for the surfacing of roads for military traffic.

Southgate U.D.C. During the three years ended October, 1914, the sum of £865 has been expended by the council on trees in streets. The number of new trees planted was 1,864. This sum of £865 includes the purchase of trees, stakes, wire-netting, cord, and binders, planting new trees, and the maintenance of both new and existing trees.

Swansea R.D.C.—Consideration is being given to a scheme for a new road from Gowerton to Penclawdd.

Tipton U.D.C.—The surveyor, Mr. W. H. Jukes, has received instructions to prepare plans and specifications for making up Hurst-street.

Winchester T.C.—The council have agreed to a scheme for widening Bridge-street, at an estimated cost of £2,130.

SEWERAGE AND SEWAGE DISPOSAL.

Bexhill T.C.—The Sanitary Committee on Monday reported that the Local Government Board had refused to sanction a loan of £360 for storm-water overflow work at Cooden. The committee therefore recommended that the work should be proceeded with, the money to come directly from the rates. Replying to Councillor Coppard, the mayor said the Local Government Board were being communicated with in regard to the legality of the proposed step.

New Mills U.D.C.—The council have under consideration a sewerage scheme for Hague Bar, the estimated cost of which is £2,300.

Reading T.C.—The borough surveyor, Mr. J. Bowen, has been instructed to prepare a report upon the proposed sewerage works in Basingstoke-road, Whitley Wood-lane, and Whitley Wood-road.

Stratford-on-Avon R.D.C.—Difficulties have arisen with respect to a proposed scheme of sewerage for Claverdon, which is estimated to cost £3,000. The council last week agreed again to negotiate with the parish council with a view to arriving at an amicable settlement.

Wantage R.D.C. A scheme has been adopted for dealing with the sewage of Charlton on land to be leased from the county council.

WATER, GAS, AND ELECTRICITY.

Barnoldswick U.D.C.—It is proposed to provide a water supply for Elslock.

Billinge U.D.C. The tender of Messrs. A. Kyle & Sons has been accepted for making a borehole.

Coventry T.C.—The nett profit of the electricity undertaking in the last financial year was £1,687.

Doncaster R.D.C.—A scheme has been prepared and submitted to the Local Government Board of a water supply for Adwick-le-Street.

Essex C.C.—An estimate of £350 has been approved for the construction of a water tank to hold 100,000 gallons at the Severalls asylum.

Greenock T.C.—Official sanction has been received to an expenditure of £30,000 upon the electricity undertaking.

Hucknall U.D.C.—The General Purposes Committee have appointed a sub-committee to go into the question of electric power and lighting.

Londonderry T.C. The council have adopted a resolution in favour of a filtering scheme for the water supply.

Ripon T.C.—The council have consented to construct a water supply to the military camp provided the War Office bear the cost, estimated at £1,000, for a new filter bed, and also pay £100 a year for filtering

Walsall T.C.—It has been decided to light with electricity the new street which is being constructed to improve the approach to the town from the Birmingham-road.

MISCELLANEOUS.

East Grinstead U.D.C.—The surveyor, Mr. W. E. Woollam, has been instructed to prepare a scheme for laying out the new cemetery.

Lees (Lancs) U.D.C.—The council recently in committee considered the question of making application to the Local Government Board for sanction to borrow the monies necessary for the provision of stables, horses and carts, to enable the council to undertake their own team labour.

Southgate U.D.C. The General Purposes Committee has been instructed to consider and make a recommendation to the council on the entire subject of filling the vacancy in the office of surveyor to the council, and the terms of any fresh appointment.

Institution of Civil Engineers.—We learn that Messrs. B. Hall, municipal engineer's office, Singapore, A. Burton, borough engineer, Stoke-on-Trent, F. W. Lawson, assistant engineer, sewerage branch P.W.D., Perth, Western Australia, and L. Roseveare, borough engineer, South Shields, have been transferred from the class of associate member to that of member of the Institution of Civil Engineers. Messrs. H. H. Bradshaw, borough surveyor's office, Rochdale, G. L. W. Butterworth, district surveyor's office, Birchington, Kent, J. H. Clarke, town hall, Lancaster, W. H. Duckworth, council offices, Watford, M. H. Shorto, P.W.D., Municipal Council, Shanghai, and S. T. Stubbs, Rangoon Municipality, have been elected associate members; and Mr. W. H. Pike, county surveyor's office, Nottingham, has been admitted as a student of the institution.

PERSONAL.

Mr. Arthur Kilburn, Leeds, has been appointed manager of Roall waterworks by the Pontefract Corporation.

Mr. W. W. Squire, engineer-in-chief of the Bristol Docks, died, we regret to state, on Monday last. He had held office since 1899.

Mr. S. Stead has been appointed city surveyor *pro tem.* of Ripon, in the absence of the city engineer and surveyor, Mr. A. Barlow, on military service.

Mr. Wm. Frank Gardner, who served his articles under Mr. J. W. Hipwood, ASSOC.M.INST.C.E., borough engineer of Morecambe, and is now assistant surveyor to the Earby Urban District Council, has been appointed assistant surveyor under the Derby Corporation.

Mr. Stanley Empsall, of the urban district council offices, Bentley, Mr. Aubrey Glyn Evans, of the borough engineer's office, Neath, and Mr. Bernard Robson, A.R.I.B.A., of Hull, have been appointed town planning assistants in the office of Mr. H. Gilbert Whyatt, M.INST.C.E., borough engineer and surveyor, Grimsby. Three town planning schemes are to be dealt with, covering an area of 13,000 acres.

Mr. A. P. I. Cotterell, M.INST.C.E., the new president of the Institute of Sanitary Engineers, is a consulting engineer practising in Westminster and Bristol. He was formerly engaged on works of railway construc-

MR. A. P. I. COTTERELL, M.INST.C.E.,
President of the Institute of Sanitary Engineers.

tion in the West of England, among these being the Exe Valley Railways, Teign Valley Railway, and the Helston Railway. Since commencing private practice, he has designed and carried out numerous sewage and water undertakings, for, among others, the towns of Surbiton, Harpenden, Bristol (suburbs), Gillingham, Minehead, Street, Glastonbury, Launceston, and St. Ives. At present he has works in hand in South Wales and the West of England, and is also consulting engineer to the Poole Corporation waterworks. Mr. Cotterell was at one time Lecturer in Sanitary Engineering to the University of Bristol, and was for some years a member of the corporation of Bristol. Business claims, however, compelled him to relinquish the latter office. He is a Fellow of the Surveyors' Institution and of the Royal Sanitary Institute, an associate of the Society of Medical Officers of Health, and a past-president of the Bristol Association of Engineers.

We deeply regret to report the death, which occurred at her residence, 5 Gwendolen-avenue, Putney, S.W., on Saturday last, of Mrs. Shone, wife of Mr. Isaac Shone, the well-known engineer and sanitarian. Mrs. Shone was in her eighthieth year.

FOR OTHER ADVERTISEMENTS
See End of Paper.

BUILDER'S MANAGER seeks situation. Good manager estimating, quantities and draughtsman; life-long experience; good references.—S., 163A Bristol-street, Birmingham. (2,265)

HERTFORDSHIRE COUNTY COUNCIL.
TO TARRING CONTRACTORS.

The Hertfordshire County Council are prepared to receive Tenders for Surface-tarring approximately 1,500,000 sq. yds. of Main Roads with Reboul Tar during the ensuing Spring and Summer.

Particulars for Tenders can be obtained from the undersigned.

Tenders must be delivered at my Office not later than 8th February, 1915.

J. S. KILLICK,
County Surveyor.

County Surveyor's Office, Hatfield.
January 18, 1915. 2,266

WILLESDEN DISTRICT COUNCIL.
ANNUAL CONTRACTS.

The Willesden District Council are prepared to receive Tenders from persons willing to enter into Annual Contracts, commencing April 1st, 1915, to Execute the following Works or to Supply the following Materials viz.:—

1. Jobbing Works in Construction of Sewers, &c.
2. Supply of Artificial Slab Paving.
3. Supply of Tar Paving and Excavating for Tar-paving Works.
4. Supply of Horses, Carts and Drivers, for cartage of various descriptions.
5. Supply of Gravel, Flint, Burnt Ballast, &c., for repair of roads, &c.
6. Supply of Broken Granite for repair of roads, &c.
7. Supply of Lime, Cement, Sand, Gravel, Water Pipes, &c.
8. Supply of Oils and Chandlery.
9. Supply of Coal and Coke.
10. Barging of Road Slop, &c., from Fermoy Wharf.
11. Supply of Horse Provender.
12. Supply of Iron Castings and Iron.
13. Supply of Timber.
14. Wood-paving Works.

Specifications and Forms of Tender may be obtained upon receipt of 5s. for each Tender Form on and after Monday, January 18th, 1915, upon application to Mr. O. Claude Robson, M.INST.C.E., Engineer to the Council, Municipal Offices, Dyne-road, Kilburn, N.W. The deposit for Tender Form will be returned upon receipt of a *bonâ-fide* Tender.

Tenders to be delivered to the undersigned not later than 4 p.m. on Tuesday, January 26th, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
STANLEY W. BALL,
Clerk of the Council.

Municipal Offices,
Dyne-road, Kilburn, N.W.
January 12, 1915. (2,260)

PETERBOROUGH COUNTY COUNCIL.
COUNTY MAIN ROADS.
MATERIALS.

Tenders are invited for the Supply of Granite, Basalts, Granite Chippings, Slag, Slag Dust, Tar-macadams, Pitch, Tar, Local Stone, Gravel, delivered either at Stations, Roadside, or at the Pits, for year ending 31st March, 1916.

Specification, Schedules, and Forms of Tender may be obtained on application to the County Surveyor, 45 Priestgate, Peterborough, to whom Tenders must be sent, in sealed envelopes, and endorsed "Materials," on or before the 25th day of January, 1915.

A. C. WALLINGFORD,
County Surveyor.

45 Priestgate,
Peterborough.
January 8, 1915. (2,263)

PETERBOROUGH COUNTY COUNCIL.
COUNTY MAIN ROADS.
STEAM ROLLING.

Tenders are invited for Steam Rolling and Scarifying on Main Roads during the year ending 31st March, 1916.

Specification and Forms of Tender may be obtained from the undersigned, to whom Tenders, [illegible] later than 25th January, 1915.

A. C. WALLINGFORD,
County Surveyor.

45 Priestgate,
Peterborough.
January 8, 1915. (2,264)

COUNTY BOROUGH OF HUDDERSFIELD.
TO CONTRACTORS.

The Corporation of Huddersfield invite Tenders for the supply and delivery of the following Materials for a period of twelve months from March 1, 1915, viz.:—

HIGHWAY MATERIALS.

1. Granite Setts, Gritstone Setts, and Granite Macadam.
2. Furnace Slag (Broken and Unbroken) for Highway Purposes.
3. Granite Slag and Limestone Tar-macadam.
4. Flags, Landings, Kerbs, &c.
5. Pitch and Creosote Oil.
6. Cast-iron Materials.
7. Portland Cement.
8. Bricks, Lime, and River Sand.
9. Hay, Straw and Provender.
10. Scavenging Machine Brushes and Brooms.
11. Earthenware Pipes, Junctions, Bends, &c.
12. House Coal for Highways Department.
13. Team Work (for all districts).
14. Shoeing Horses.
15. Oils (Engine, Cylinder, Gas Engine, Heavy Bearing and Petroleum).
16. Coal for Model Lodging-house.
17. Coal for Ramsden-street Baths.
18. Coal for Lockwood Baths.

The successful tenderer will be required to execute a Contract, the draft of which may be inspected at the Town Clerk's Office, Town Hall, between 10 and 4 o'clock (except Saturdays).

Specifications and Forms of Tender may be obtained on application at the offices of Mr. K. F. Campbell, M.INST.C.E., M.I.E.E., Borough Engineer and Surveyor, 1 Peel-street.

Please state the number of Tender Form required.

Sealed Tenders, endorsed "Tender for Granite Setts," or as the case may be, signed in the handwriting of the tenderer or his agent, and addressed Town Clerk, Town Hall, Huddersfield, must reach him not later than Saturday, 30th January, 1915.

The Corporation do not bind themselves to accept the lowest or any Tender.

J. HENRY FIELD,
Town Clerk.

Town Hall, Huddersfield.
January 12, 1915. (2,261)

CITY OF LEEDS.
ANNUAL CONTRACTS FOR STORES.

The Sewerage Committee invite Tenders for the supply of the following Stores during the twelve months ending March 31, 1916:—

Cement.
Earthenware Drain Pipes, &c.
Sewer Ironwork.
Galvanised Dirt Boxes.
Sewer Ventilating Columns.

Forms of Tender, Schedules and all particulars may be obtained at the office of the undersigned.

Tenders must be on the official forms, properly endorsed, and delivered at the Town Clerk's Office, Great George-street, Leeds, not later than 10 a.m. on Monday, February 8, 1915.

The Corporation do not bind themselves to accept the lowest or any Tender.

W. T. LANCASHIRE,
City Engineer.

Municipal Buildings, Leeds.
January 11, 1915. (2,262)

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

GENERAL ASSISTANT.—January 18th.—Ulverston Urban District Council. £1 15s. per week.—Mr. C. Telford Hague, surveyor, Town Hall, Ulverston.

CLERK OF WORKS.—January 18th.—Pembrokeshire Education Committee. £2 2s. per week.—Mr. O. T. Thomas, architect, County Education Offices, Haverfordwest.

SURVEYOR'S ASSISTANT.—January 18th.—Caerphilly Urban District Council. £80—£100 per annum. —Chairman of the Finance Committee, Council Offices.

CLERK OF WORKS.—January 19th.—Rochford Rural District Council. £3 3s. per week.—Mr. Frederic Gregson, clerk.

SURVEYOR.—January 19th. — Withnell Urban District Council.—Mr. J. Taylor, clerk, 41 Ainsworth-street, Blackburn.

DISTRICT SURVEYOR.—January 20th.—Williton Rural District Council. £150 per annum, with an allowance of £40 for a motor.—Mr. Frank Risdon, clerk, Williton, Taunton.

GENERAL FOREMAN.—January 21st.—Corporation of Guildford. 50s. per week, with house and cycle.—Mr. A. D. Jenkins, town clerk.

ROAD SURVEYOR.—January 23rd.—East Lothian County Council. £300, with motor car and £100 for expenses.—Mr. J. D. Watson, Western District clerk, Haddington.

SURVEYOR'S ASSISTANT.—January 23rd.—Langport Rural District Council. £75 per annum.—Mr. E. Q. Louch, clerk, Council Offices, Langport, Somerset.

TEMPORARY SURVEYOR AND INSPECTOR.—January 26th.—Corporation of Haverfordwest. £150 per annum.—Mr. R. T. P. Williams, town clerk.

TEMPORARY ASSISTANT.—January 26th.—Corporation of West Hartlepool. £110 per annum.—Mr. Nelson F. Dennis, borough engineer and surveyor.

CITY ENGINEER AND SURVEYOR.—January 31st, 1915.—Port-of-Spain Corporation. £725, inclusive of travelling allowance.—Mr. Joseph Arnold Lamy, town clerk, Town Hall, Port-of-Spain, Trinidad, B.W.I.

CHIEF SANITARY OFFICER.—February 15th.—Jharia Board of Health, India. £80—£100 per month. —Mr. S. R. Hignall, deputy commissioner of Manbhum, and chairman of the Jharia Board of Health, Purulia, B.N.Ry., Bihar and Orissa, India.

ASSISTANT ENGINEERS. — April 1st. — Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

LIVERPOOL.—February 8th.—Designs for working-class dwellings, for the corporation. Premiums, £100, £50, and £25.—Mr. E. R. Pickmere, town clerk.

CLUTTON.—February 23rd.—Schemes for providing a public water supply, for the parishes of Chelwood, Chew Magna, Chew Stoke, Norton, Malreward, Publow, and Stanton Drew, for the rural district council. Premiums of £100 and £50 will be awarded to the first and second best competitors.—Mr. J. Sumner Dury, clerk, Temple Cloud, Bristol.

WALTHAMSTOW.—Plans for the erection of workmen's dwellings at an estimated cost of £16,000, for the urban district council.—Mr. C. S. Watson, clerk, Town Hall.

BRADFORD.—Designs for the re-planning of streets in the central area of the city, for the corporation.—Mr. Reginald Blomfield, R.A., has been nominated assessor.—Mr. F. Stevens, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

PORTSMOUTH.—January 18th.—For the erection of a school, for the Education Committee.—Mr. A. E. Cogswell, architect, Prudential Buildings, Portsmouth.

MONMOUTH.—January 18th.—For the erection of two schools, for the Education Committee.—Mr. J. Bain, County Council Offices, Newport.

PLYMOUTH.—January 18th.—For the construction of a cast-iron outfall, dredging a channel, and incidental works, for the corporation.—Mr. J. Paton, borough engineer and surveyor.

HAMPSHIRE.—January 19th.—For the erection of offices for 305 children on the site of a new school, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

WARRINGTON.—January 19th.—For the erection of six cast-iron tramway shelters, for the corporation. —Borough Surveyor.

COLCHESTER.—January 20th.—For additions to a hospital, for the Borough and Port Health Committee. —Mr. H. Collins, borough engineer and surveyor.

MANCHESTER.—January 20th.—For alterations to a school, for the Education Committee.—Education Offices, Deansgate.

DARWEN.—January 20th.—For the construction of public baths, for the corporation.—Mr. R. W. Smith-Saville, borough surveyor.

THAKENHAM.—January 21st.—For laying cast-iron pipes and erection of engine-house, for the rural district council.—Major Tulloch & Haworth, engineers, 28 Victoria-street, Westminster, S.W.

GALWAY.—January 23rd.—For the erection of a sanatorium, for the county council.—Mr. W. A. Scott, architect, 45 Mountjoy-square, Dublin.

PRESTON (Sussex).—January 25th.—For the erection of four cottages, for the rural district council.—Mr. A. Shelley, Littlehampton.

BECKENHAM.—January 25th.—For culverting a stream and the construction of a culvert, for the urban district council.—Mr. J. A. Angell, surveyor.

LUDLOW.—January 26th.—For the erection of twenty-two cottages, for the corporation.—Mr. J. Butters, architect, Ludlow.

STAFFS.—January 26th. — For the erection of a farm institute, for the Education Committee.—Mr. Graham Balfour, director of education, Stafford.

LONDON.—January 26th.—For building an engine-house and other works at Poplar, for the county council.—Chief Engineer, Spring-gardens, S.W.

ROCHDALE.—January 27th.—For the erection of tramcar repair shops, for the corporation.—Mr. P. W. Hathaway, Town Hall.

UPHOLLAND.—January 30th.—For the erection of eight workmen's houses, for the urban district council. —Mr. A. Hunt, surveyor.

BURY (Lancs).—January 30th.—For the construction of an extension to reinforced-concrete retaining wall, for the corporation.—Mr. J. A. Settle, borough engineer.

LONDON.—February 2nd.—For the supply of building materials, for the Prison Commissioners. Home Office, Whitehall, S.W.

PORTSMOUTH.—February 4th.—For extensions to a hospital, for the corporation.—Mr. G. H. Etherton, town clerk.

BOMBAY.—March 7th (date extended).—For the erection and equipment of a refuse destructor, for the Municipal Commissioner.—Messrs. Henry S. King & Co., 65 Cornhill, London, E.C.

Iron and Steel.

MANCHESTER.—January 20th.—For the supply of ventilating grids and castings, for the corporation.—Mr. H. Prescott, Drainage Department.

LLANTRISANT.—January 20th.—For laying pipes and providing valves in connection with the Llantwit

Fardre waterworks, for the rural district council.—Mr. G. S. Morgan, engineer, 25 Gellideg[illegible], Pontypridd.

SALFORD.—January 21st.—For the supply and [illegible] of the Corporation.—Mr. T. C. Evans, town clerk.

LONDON.—January 26th.—For the supply of the materials required during the ensuing [illegible] Mr. G. W. Humphreys, [illegible] Surveyor, [illegible], S.W.

NANTWICH.—January 23rd.—For the supply of about 2,400 lineal yards of cast-iron pipes, [illegible] and other pieces, hydrants, sluice valves, fittings, and [illegible] and laying about 2 miles of cast-iron water mains, for the rural district council.—Mr. C. E. Davenport, 162 Hospital-street, Nantwich.

Roads.

SHEFFIELD.—January 18th.—For the [illegible] of High Bridge, Penistone-road, for the Corporation.—City Engineer, Town Hall.

WANDSWORTH.—January 18th.—For making up a certain road, for the borough council.—Mr. P. Dodd, borough surveyor.

SURREY.—January 19th.—For the supply of high-[illegible] granite, [illegible] and tar oils, flints, and fine gravel, for the county council.—Mr. A. Dryland, county surveyor, County Hall, Kingston-upon-Thames.

SKIPTON.—January 19th.—For the supply of road materials, for the rural district council.—Mr. A. Rodwell, surveyor.

LUTON.—January 21st.—For executing private street works, for the [illegible] Estates, Ltd.

CHERITON.—January 22nd.—For the supply of 500 or 1,000 tons of Welsh, Leicester, or other approved granite, hand-broken to a gauge of 3 in., for the urban district council.—Mr. William R. Coveney, acting surveyor, Public Offices, Cheriton.

CARDIGAN.—January 23rd.—For strengthening and surfacing a main road with Welsh granite, and tar-spraying, for the county council.—Mr. David Davies, county surveyor, Brynhyfryd, Felinfach S.O.

BIRMINGHAM.—January 23rd.—For the supply of granite kerbs, setts, crossing stones, chippings, flags, paving bricks, wood paving blocks, ragstone, limestone, tarred limestone, tarred roadstone, gravel, sand and slag, for the Public Works Committee.—Mr. Henry E. Stilgoe, city engineer and surveyor, Council House.

HENDON.—January 25th.—For road widening and wood and stone paving works, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

SLEAFORD.—January 25th.—For the supply of granite and slag, for the rural district council.—Mr. E. H. Godson, clerk, 74 Southgate.

BECKENHAM.—January 25th.—For making up St. George's-road, for the urban district council.—Mr. J. A. Angell, surveyor.

BIRMINGHAM.—January 25th.—For making up a road, for the Public Works Committee.—Mr. H. E. Stilgoe, city engineer and surveyor.

BARKING.—January 26th.—For road widening, for the urban district council.—Mr. R. A. Lay, acting surveyor, Public Offices, Barking.

CARDIGANSHIRE.—January 26th.—For strengthening and surfacing the Cardigan to Cenarth main road with Welsh granite, and tar-spraying, for the county council.—Mr. David Davies, county surveyor's office, Felinfach, S.O.

BARNET.—January 27th.—For the supply of a 10-ton steam roller with scarifier, for the urban district council.—Mr. W. B. Chancellor, engineer and surveyor, 40 High-street.

ESSEX.—January 27th.—For the supply of stone-ware pipes, Norwegian granite kerb and setts, York kerb, distilled tar, and team labour, for the Highways Committee.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

FULHAM.—January 27th.—For making up Net-road, for the borough council.—Mr. F. Wood, borough surveyor.

OTLEY.—January 29th.—For the supply of granite, limestone, tar-macadam, slag dust, setts, kerb, flags, pitch, and hauling stone, for the urban district council.—Mr. C. F. Hodgson, surveyor.

BRIDGWATER.—January 30th.—For the supply of road stone, for the rural district council.—Mr. W. A. Collins, surveyor, 56A Eastover, Bridgwater.

SOUTHAMPTON.—January 30th.—For the supply of British macadam, for the rural district council.—Mr. F. Heather, district surveyor, Chevin Side, Old Portswood, Southampton.

SOUTH STONEHAM.—January 30th.—For the supply of British macadam, for the rural district council.—Mr. C. Cecil Donniy, clerk, 20 Portland-street, Southampton.

HERTFORDSHIRE.—January 30th.—For supply of wood and granite-sett paving, for the county council.—Mr. J. S. Killick, county surveyor.

HERTS.—February 1st.—For the supply of hand-picked surface flints, dug gravel, hoggin, shingle, sand and team labour, for the county council.—Mr. J. S. Killick, county surveyor, Hatfield.

SOMERSET.—February 1st.—For the supply of broken granite or basalt, and steam rolling, for the county council.—Mr. E. Stead, county surveyor, Wells.

SUTTON-IN-ASHFIELD.—February 1st.—For the supply of tar-macadam and broken slag, for the urban district council.—Mr. W. Burn, surveyor.

MIDDLESEX.—February 3rd.—For the supply of about 7,500 tons of 2-in. and 1½-in. hand-broken basalt, and 500 tons of ¾-in. chippings, for the county council.—Mr. H. T. Wakelam, county engineer, Middlesex Guildhall, Westminster.

CUCKFIELD.—February 3rd.—For the supply of about 7,000 tons of broken granite, tarred material, and flints, for the rural district council.—Mr. A. MacArthur, surveyor, Council Offices, Haywards Heath.

TANGIER.—February 20th.—For works of road construction and improvement, for the Special Committee of Public Works.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

Sanitary.

PLYMOUTH.—January 18th.—For the construction of a 54-in. cast-iron outfall, about 120 ft. in length, on piles, dredging a channel, laying a 54-in. concrete culvert, and other incidental works, for the corporation. Mr. James Paton, borough engineer and surveyor, Municipal Offices.

HAMBLEDON.—January 18th.—For the collection and removal of refuse, for the rural district council.—Mr. F. Smallpeice, clerk, 138 High-street, Guildford.

MANCHESTER.—January 18th.—For the construction of main drainage work No. 5 (new intercepting sewer, Great Ancoats-street, Swan-street, and Rochdale-road), for the corporation.—City Surveyor.

NUNEATON.—January 20th.—For the construction of a sewer, for the corporation.—Mr. F. C. Cook, borough engineer.

DARLASTON.—January 21st.—For the construction of stoneware pipe sewers, manholes, cast-iron pipes, tanks, filters, and other works, for the urban district council.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

SWANSEA.—January 23rd.—For the construction of surface-water pipes and manholes, for the corporation.—Borough Engineer, Guildhall.

DISLEY.—January 25th.—For laying 2,300 lin. yds. of 9-in. stoneware and cast-iron sewers and manholes, for the rural district council.—Mr. C. S. Righton, engineer, 18 Market-street, Marple.

ROWLEY REGIS.—January 25th.—For relaying sewer and storm-water drain, and other works, for the urban district council.—Council House, Old Hill.

ST. ALBANS.—January 27th.—For the construction of concrete sedimentation and humus tanks, primary and secondary bacteria beds, necessary drains, connections, extension of buildings, and alteration to existing bacteria beds, for the corporation.—Mr. Howard Humphreys, consulting engineer, 28 Victoria-street, Westminster, S.W.

CHAILEY.—January 29th.—For works of sewerage, for the rural district council.—Mr. H. Bertram Nichols, engineer, 11 Victoria-street, Westminster, S.W.

COCKERMOUTH.—January 29th.—For laying 3,600 yards of sewers, constructing manholes, and other works, for the rural district council.—Mr. J. B. Wilson, Grecian Villa, Cockermouth.

PENDLEBURY.—January 30th.—For the construction of sewers and manholes, for the urban district council.—Mr. H. Entwistle, engineer and surveyor, Council Offices, Swinton, Manchester.

Stores.

ROTHERHAM.—January 18th.—For the supply of stores, for the gas department of the corporation.—The Manager, Gasworks.

ST. PANCRAS.—January 18th.—For the supply of horse water-vans, horse road-sweeping and other machines, cartage, timber and joinery, creosoted deal blocks, Jarrah wood blocks, barrows, trucks, handles, paints, oils, candles, chandlery, smiths' and founders' works, ironmongery, tools, hardware goods, Yorkshire stone, artificial slabs, granite kerbs, paving setts, broken granite, Kentish rag, gravel and other roadway materials, lime, cement, bricks, stoneware pipes, glazed goods, brass brooms, horse brush stock, tarpaulins, hemp and rubber goods, pitch, tar, creosote oil, carbolic powder, coke, and the removal of road sweepings and gully soil, for the borough council.—Mr. Nichol Black, borough engineer and surveyor.

BIRMINGHAM.—January 20th–25th.—For the supply of lias lime, Portland cement, drain pipes, gullies, gully pans, brown bricks, timber, drysaltery, malleable-iron castings, iron castings, galvanised goods, iron and steel ware, lamps, glass, enamelling, brooms, hose pipe, hose couplings, rubber goods, incandescent mantles, cane sewer rods, chamois leathers, tarpaulins, lines, cords, mops, coke, and bags, for the Public Works Committee.—Mr. Henry E. Stilgoe, city engineer and surveyor, Council House.

STLPNEY.—January 23rd.—For the supply of bricks, lime, fireclay, cast iron work, colours, varnishes, painters' brushes, drainage materials, oilman's goods, Portland cement, pitch, bitumen, tar, green oil, timber, tools, implements of ironmongery, uniform clothing, boots and disinfectants, for the borough council.—Mr. W. Jameson, Municipal Offices, 15 Great Alie-street, Whitechapel, E.

BIRMINGHAM.—January 23rd.—For the supply of uniform clothing, for the Public Works Committee.—Mr. Henry E. Stilgoe, city engineer and surveyor, Council House.

SHEFFIELD.—January 23rd.—For the supply of cement, earthenware pipes, blocks, traps, concrete flags, granite setts, kerb, ringsmall, gravel, chips, limestone, slag shingle, pitch, tar, and creosote oil, for the Highways and Sewerage Committee.—Mr. W. J. Hadfield, city surveyor, Town Hall.

LEIGH.—January 25th.—For the supply of grit setts, kerbstones, channel stones, macadam, chippings, sewerage pipes, castings, pitch, and creosote oil, for the corporation.—Mr. Tom Hunter, borough engineer and surveyor, Town Hall, Leigh, Lancs.

CHISWICK.—January 27th.—For the supply of oils, motor spirit, drysaltery, ironmongery, disinfectants, alumino-ferric or copperas, lime, cement, Kentish pit flints, hoggin, blue Guernsey granite, and other broken road stone, York and other paving, tarred granite slag and limestone paving, tar, asphalt, pipes, gullies, sludge presses, and hire of horses and drivers, for the urban district council.—Mr. Edward Willis, surveyor, Town Hall.

OTLEY.—January 29th.—For the supply of granite, limestone, tar-macadam, slag dust, setts, kerb, flags, pitch, brushes, coal, and hauling stone, for the urban district council.—Mr. C. F. Hodgson, surveyor, Council Offices, Otley.

GRIMSBY.—January 29th.—For the supply of chalk, whinstone macadam, artificial flags, Yorkshire flags, Yorkshire kerbs, granite setts, granite kerbs and channel, pitch, coal-gas tar, Buxton quicklime, blue lias lime, dog-kennel lime, Portland cement, drainage pipes, brushes, drysalteries, oils, paints, disinfectant fluid, disinfectant powder, and formalin, for the corporation.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

FROME.—January 30th.—For the supply of scavenging brushes, Portland cement, broken limestone, broken granite, tarred material, tools, kerbing, channelling, pennant and concrete flagging, and coal, for the urban district council.—Mr. F. W. Jones, Public Offices, Frome.

WIGAN.—January 30th.—For the supply of brooms, horse brush stocks and brushes, Portland cement, lime, common bricks, stoneware pipes, gullies, pitch, and creosote oil, manhole and gully grates, iron and tools, timber, oils and paints, glass and glazing, ironmongery, grit setts, kerbstones, channel stones, flags, gravel, chippings, and macadam, for the corporation.—Mr. A. T. Gooseman, borough engineer and surveyor.

OSSETT.—February 1st.—For the supply of materials, stores, and workmen's tools required in the highways, gas, lighting, water, sanitary and educational departments, for the corporation.—Borough Surveyor.

YORK.—February 1st.—For the supply of Portland cement, pitch and creosote oil, stoneware pipes, building lime, Yorkshire-stone flags, kerbing and edging, whinstone and limestone chippings, for the corporation.—Mr. F. W. Spurr, city engineer.

Miscellaneous.

EAST GRINSTEAD.—January 20th.—For the sale of a steam roller, No. 2,711, by Aveling & Porter.—Mr. Charles Turton, surveyor, 6 High-street, East Grinstead.

BIRKENHEAD.—January 23rd.—For the supply of a petrol motor fire engine, for the corporation.—Superintendent, Fire Brigade, Charing Cross, Birkenhead.

SOWERBY.—January 27th.—For the supply and erection of filtration plant, for the proposed new baths.—Mr. James Eastwood, engineer and surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance
‡ Provisionally accepted.

CANNOCK.—For the supply of refined tar prepared in accordance with the specification of the Road Board, for the urban district council.—Mr. E. Blanchard, engineer and surveyor:—

J. L. C. Laird, Manchester.
Marco & Co., Limited, Wolverhampton.
Brotherton & Co., Limited, Leeds.
Jones Brothers, West Bromwich.
J. Hardman, Limited, Stoke-on-Trent.
Robinson Brothers, Limited, Birmingham.
Anglo-Mexican Petroleum Products, Limited, London.
Manchester and Sheffield Tar Works Company, Limited, Manchester.
Brownhills Chemical Works, Brownhills, near Walsall.

DOCKING.—For the erection of six houses, for the rural district council:—

F. Southgate, Hunstanton £1,087
R. Shanks, Hunstanton and Chatteris . . . . . —

DUCHAM.—For the construction of sewers at Spring Well and Sherburn, for the rural district council:—

Springwell.—J. Douglas, £750; J. Carrick, £595; R. Oliver, £557.
Sherburn.—J. Douglas, £178; R. Oliver, £142; A. Armeane, £145; J. Carrick, £150.

GILLINGHAM.—For the erection of a block of dwellings, for the corporation.—Mr. J. L. Brebner, borough surveyor.

Saunders & Co., Canterbury £1,623
G. Gates & Sons, Frindsbury 1,475
West Brothers, Rochester . . . . . —
H. E. Phillips, Gillingham 1,297
C. E. Skinner & Son, Chatham . . . . . —

HEBDEN BRIDGE.—For extensions to sewage disposal works, for the urban district council.—Messrs. J. Newton, Son & Bayley, engineers, Manchester.

J. M. Firth, Todmorden.

KINGSTOWN.—For the erection of thirty-six artisans' dwellings at Sallynoggin, for the urban district council:—

G. Bowers, Ballybrack £7,45
A. Fraser, Dublin 7,450
H. Duncan & Sons, Dublin 7,200
M. J. O'Brien, Glasthule 7,185
F. Weaver, Glasthule 7,140
J. Plunkett, Ballybrack 6,934
W. Jennings, Kenmare* 6,850

STOWMARKET.—For the supply of 69 tons of tar, for the urban district council.—Mr. G. W. Lingwood, surveyor:—

CRUDE TAR.

	Per gallon. d
Forbes, Abbott & Lennard, Limited, London	3
Gas Light and Coke Company, London	4
Ipswich Gas Light Company*	3

REFINED TAR.

Brotherton & Co., Limited, Leeds	4
T. Crow & Son, London*	3½
British Gas Light Company, Limited, Norwich	3½

WYCOMBE.—For the erection of six houses, for the rural district council.—Mr. A. L. Grant, building surveyor:—

Smallbone & Son, Streatley-on-Thames £1,910
Lovell & Son, Gerrards Cross and Marlow 1,545
C. H. Hunt & Co., High Wycombe 1,177
Harris & Co., Marlow 1,170
F. Nash, High Wycombe* 1,135

YORK. For the erection of weights and machinery [illegible] for the corporation. [illegible] W. Stott, City Engineer. W. Birch & Son, Limited, York. [illegible]

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JANUARY.

14. Town Planning Institute. Discussion on the Ewell Northwood Scheme. 92 Victoria-street, S.W. 8 p.m.
21. Concrete Institute. 20 Lowell's Andrews on Some Methods of Arch Construction. 28 Victoria Embankment, S.W. [illegible]

FEBRUARY.

[illegible] Rural Sanitary Institute. Visits of Members of Sanitary Committees. Annual Meeting. [illegible]

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

LANGPORT RURAL DISTRICT COUNCIL.

SURVEYOR'S ASSISTANT.

The Council invite applications from [illegible] Engineering and Surveying for the appointment of a Surveyor's Assistant. Salary at the rate of £75 per annum, payable monthly.

[illegible] applications will be sent to the undersigned [illegible] of the Surveyor and [illegible] not later than [illegible].

Applications [illegible] endorsed "Surveyor's Assistant," [illegible] copies of not more than three recent testimonials, [illegible] to the undersigned [illegible] Saturday, 23rd inst.

By order,
EDWD. Q. LOUCH,
Clerk to the Council.

Council Offices,
Langport.
January 12, 1915. (2,250)

COUNTY BOROUGH OF WEST HARTLEPOOL.

TEMPORARY ASSISTANT IN BOROUGH ENGINEER'S DEPARTMENT.

Applications are invited by the undersigned for the temporary appointment in the Borough Engineer's Department. Applicants must be Civil Engineers, and must have had experience in the [illegible] Bridges and Drainage Engineering and Surveying. [illegible] £150 per annum.

Applications, [illegible] Assistant, stating [illegible] and [illegible] with copies of [illegible] testimonials, and stating the earliest date on which the applicant can take up duties, if appointed, must be forwarded to the undersigned not later than Tuesday, the 26th January, 1915.

NELSON F. DENNIS, M.INST.C.E.,
Borough Engineer and Surveyor.
Municipal Buildings,
West Hartlepool.
January 12, 1915. (2,254)

BOROUGH OF HAVERFORDWEST.

TEMPORARY APPOINTMENT OF SURVEYOR AND INSPECTOR OF NUISANCES.

The Town Council invite applications for this Appointment (during the continuance of the present war). Salary at the rate of £150 per annum (£50 as Surveyor and £100 as Inspector of Nuisances).

The person appointed will be required to reside in the town, and to take up his duties immediately after his appointment, and to devote the whole of his time to the office. Applicants must hold a Certificate of the Royal Sanitary Institute, or other similar examining body, and must have practical experience of Sanitary work, and the Management of Roads, Sewerage and Waterworks. Applications, with copies of three recent testimonials, stating age, must be sent to the undersigned not later than Friday, the 22nd day of January inst. The appointment [illegible] to commence [illegible] 29, 1914. [illegible] Medical Officer [illegible]

R. W. WILLIAMS,
[illegible]

Town Clerk's Office,
Haverfordwest.
[illegible] 11, 1915. (2,2[illegible])

COMPETITIONS OPEN.

WATER SUPPLY.

PARISHES OF CHELWOOD, CHEW MAGNA, CHEW STOKE, NORTON, HALESWOOD, PUBLOW AND STANTON DREW.

The Rural District Council of [illegible] Parishes [illegible] to obtain the best and most economical scheme for providing a public Water Supply for the above-named Parishes, and the following conditions:—

1. The Scheme must include the estimated cost of the Works [illegible] Plans and Bills of Quantities.
2. A Fee of £[illegible] will be [illegible] the successful [illegible] for his services.
3. The [illegible] will be awarded.
4. There will be no appeal [illegible] decision.
5. No [illegible] will be considered unless [illegible] in connection [illegible] and [illegible] Board [illegible] Plans [illegible] further particulars.
6. The successful scheme, including Plans and Bills of Quantities, will become absolute property of the Council.
7. The [illegible] reserve [illegible] to accept [illegible] in accordance [illegible] the [illegible] Board [illegible] the Scheme [illegible] the Scheme should [illegible] given.
8. The said Council reserve to themselves the right [illegible] the Scheme [illegible] the existing mains of the said Council, from the mains [illegible] Water Company [illegible] or other source, so that any parish or parishes may be supplied from different sources if desirable.

Schemes [illegible] Tuesday, the 23rd February next, the covering envelope [illegible] "Chelwood Water Scheme."

(By order)
J. [illegible] DOBY,
Clerk of the said Council.

Temple Cloud, Bristol.
January [illegible], 1915. (2,242)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

THE FROME URBAN DISTRICT COUNCIL.

TENDERS FOR STORES.

The above-named Council invite Tenders for the supply of the following Materials, &c., for the year ending March 31, 1916:—

Scavenging Brushes, Portland Cement, Broken Limestone, Broken Granite, Tarred Material, Tools, Kerbing, Channelling, Pennant and Concrete Flagging and Coal.

Particulars and Forms of Tender may be obtained from Mr. F. W. Jones, ASSOC.M.INST.C.E., the Public Offices, Christchurch-street West, Frome.

Tenders must in all cases be made on the prescribed Forms, and delivered at my Office, addressed to the Chairman of the Council, not later than 12 noon, January 30, 1915.

The Council does not bind itself to accept the lowest or any Tender.

(By order)
H. E. AMES,
Clerk.

The Public Offices,
Christchurch-street West,
Frome.
January 12, 1915. (2,255)

BECKENHAM URBAN DISTRICT COUNCIL.

TO CONTRACTORS.

The Beckenham Urban District Council invite Tenders for the making up of St. George's-road, Beckenham. The works comprise the supply and laying of about 400 lin. yds. granite kerb and channelling, 360 cub. yds. of hardcore, 200 cub. yds. field flints, 700 super. yds. of tar-paving, and other incidental works.

Plans and Sections may be seen, and Bills of Quantities, Specifications and Forms of Tender obtained, on application to Mr. John A. Angell, Surveyor, on and after January 11th, on the production of a receipt from the Collector for a deposit of £2, which will be returned on the receipt of a *bonâ-fide* Tender.

A clause will be inserted in the Contract providing that the Contractor shall (1) pay to the employees the wages generally accepted as current for workmen engaged on similar work in the town where the work is executed, and (2) to the extent of 75 per cent at least of the staff required in the execution of such works, give preference to and engage such competent workmen of the class required as may be *bonâ-fide* residents in the Parish of Beckenham, and may offer themselves for employment.

Payment under the Contract will not be made until six months after the completion of the works.

Tenders, duly sealed and endorsed "Tenders for Street Works," to reach undersigned not later than 4 p.m., Monday, January 25, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

F. STEVENS.
Clerk of the Council.

January 6, 1915. (2,234)

BECKENHAM URBAN DISTRICT COUNCIL.

TO CONTRACTORS.

The Beckenham Urban District Council invite Tenders for (*a*) the culverting of stream between Cromwell and Hampden Roads, and (*b*) the construction of a culvert under Cedars Road.

The works include some 270 cub. yds. of cement concrete, and 400 cub. yds. of excavation.

Plans and Sections may be seen, and Bills of Quantities, Specifications and Forms of Tender obtained, on application to Mr. John A. Angell, Surveyor, on and after January 11th, on the production of a receipt from the Collector for a deposit of £1, which will be returned on the receipt of a *bonâ-fide* Tender.

A clause will be inserted in the Contract providing that the Contractor shall (1) pay to the employees the wages generally accepted as current for workmen engaged on similar work in the town where the work is executed, and (2) to the extent of 75 per cent at least of the staff required in the execution of such works, give preference to and engage such competent workmen of the class required as may be *bonâ-fide* residents in the Parish of Beckenham, and may offer themselves for employment.

Tenders, duly sealed and endorsed "Tenders for Culverts," to reach undersigned not later than 4 p.m., Monday, January 25, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

F. STEVENS.
Clerk of the Council.

January 6, 1915. (2,235)

HERTFORDSHIRE COUNTY COUNCIL.

LONDON-ROAD, BUSHEY.

WOOD AND GRANITE SETT PAVING.

The Highways Committee of the County Council invite Tenders for Laying London-road, Bushey (between the Middlesex County Boundary and the Watford Urban District Boundary) with Creosoted Deal Paving (approximate area 31,000 sq. yds.), and a short length with Granite Sett Paving (approximate area 3,000 sq. yds.).

Persons desiring to Tender for the Work may see the Drawings, Specification, Agreement, &c., at the County Surveyor's Office, Hatfield, on or after Monday, 18th January, 1915, between the hours of ten a.m. and four p.m., except on Saturdays, when they may be seen from ten a.m. till twelve noon.

A copy of the Schedule of Works and a Form of Tender can be obtained at the County Surveyor's Office upon payment of Two Guineas, which sum will be returned to the Tenderer upon receipt of a *bonâ-fide* Tender and the documents which have been supplied to him.

Sealed Tenders, endorsed "Tenders for Wood Paving, Bushey," must be delivered to the undersigned at his Office, not later than 12 noon on Saturday, 30th January, 1915.

Such security for the due execution of the works as the Council may require must be given by the Contractor.

The lowest or any Tender will not necessarily be accepted.

J. S. KILLICK.
County Surveyor.

County Surveyor's Office,
Hatfield.
January 12, 1915. (2,259)

METROPOLITAN BOROUGH OF STEPNEY.

The Council of the Metropolitan Borough of Stepney hereby invite Tenders for Contracts for one year, from 31st March, 1915, as follows:—

(1) Supply of Bricks, Lime and Fireclay.
(2) Supply of Cast-iron Work.
(3) Supply of Colours, Varnishes, Painters' Brushes, &c.
(4) Supply of Drainage Materials.
(5) Supply of Oilman's Goods.
(6) Supply of Portland Cement.
(7) Supply of Pitch, Bitumen, Tar and Green Oil.
(8) Supply of Timber.
(9) Supply of Tools, Implements and Ironmongery.
(10) Supply of Uniform Clothing.
(11) Supply of Boots.
(12) Chimney Sweeping.
(13) Clock Winding, &c.
(14) Window Cleaning.
(15) Supply of Disinfectants.

Persons tendering must submit the names and addresses of two substantial persons willing to be jointly and severally bound for the due and proper performance of their several Contracts.

Contractors will be required at all times during the existence of their Contracts to pay the Trade Union rates of wages as agreed to by the Employers' Associations and Trade Unions, and as in practice obtain.

Contractors will also be prohibited from assigning or underletting their Contracts without the written consent of the Council previously obtained.

Forms of Tender, Specifications, Stipulations, and other Conditions for items numbered (1) to (9) inclusive may be obtained upon application to the Borough Engineer (Mr. M. W. Jameson, Assoc.M. Inst.C.E.), at the Municipal Offices, No. 15 Great Alie-street, Whitechapel, E., on and after Thursday, the 14th January, 1915, between the hours of ten and twelve a.m., upon deposit of a £5 Bank of England note in respect of each Tender.

Forms of Tender and Specifications for items numbered (10) to (15) inclusive may be obtained upon application to the undersigned at the Municipal Offices, No. 15 Great Alie-street, Whitechapel, E., on and after Thursday, the 14th January, 1915, between the hours of ten a.m. and twelve noon, upon deposit of £1 in respect of each Tender.

The deposit will in each case be returned upon receipt of a *bonâ-fide* Tender, together with the other documents.

Tenders must be enclosed in the envelopes to be provided by the Council, and sent to the undersigned on or before noon on Saturday, the 23rd January, 1915.

The Council do not bind themselves to accept the lowest or any Tender, and will not accept the Tender of any person or firm who on any previous occasion has withdrawn a Tender after the same has been opened, unless the reasons for the withdrawal were at the time satisfactory to the Council, and the Council, moreover, reserve to themselves the right of dividing the contract between one or more of the persons tendering.

(By order)

GEO. W. CLARKE.
Town Clerk.

Municipal Offices,
15 Great Alie-street,
Whitechapel, E.
January 7, 1915. (2,246)

RURAL DISTRICT COUNCIL OF CUCKFIELD

TENDERS FOR ROAD MATERIAL

SEASON 1915.

The [illegible] Council invite Tenders for the supply of about 7,000 tons of Broken Granite, Tarred Material and Flints, to be delivered in such quantities and at such times as the Council shall direct.

Further particulars and Forms of Tender can be obtained on application to Mr. A. Macarthur, C.E., Surveyor, Council Offices, Haywards Heath.

Tenders endorsed "Road Material" to be delivered with me not later than Wednesday, February 3, 1915.

(Signed) C. H. WAUGH,
Clerk to the Council.

Council Offices, Boltro Road,
Haywards Heath.
January 12, 1915. (2 [illegible])

BOROUGH OF LEIGH

The Corporation of Leigh are prepared to receive Tenders for the supply of the following Materials during the year ending March 31, 1916:—

Grit Setts.
Kerbstones.
Channel Stones.
Macadam.
Chippings.
Sewerage Pipes.
Castings.
Pitch.
Creosote Oil.

Specifications, Forms of Tender, and all requisite information may be obtained from Mr. Tom Hunter, Borough Engineer and Surveyor, Town Hall, Leigh, Lancashire.

Sealed Tenders, on Official Forms, are to be delivered at the office of the undersigned by noon on the 25th January.

W. H. COWBURN,
Town Clerk.

Town Hall, Leigh, Lancs.
January 13, 1915. (2 [illegible])

Calno
Reg^d

THE ONLY FIRE-RESISTING FIBRE
BUILDING BOARD
MADE IN
GREAT BRITAIN

Does not Split or Crack. Bound with Cement Binder.
Tensile Strength over 300lb. to the square inch.

TESTED AND CERTIFIED by the BRITISH FIRE-PREVENTION COMMITTEE.

PASSED by the L.C.C.

Fire and Damp Resisting.

Germ and Sound Proof.

Non-conductor of heat or cold.

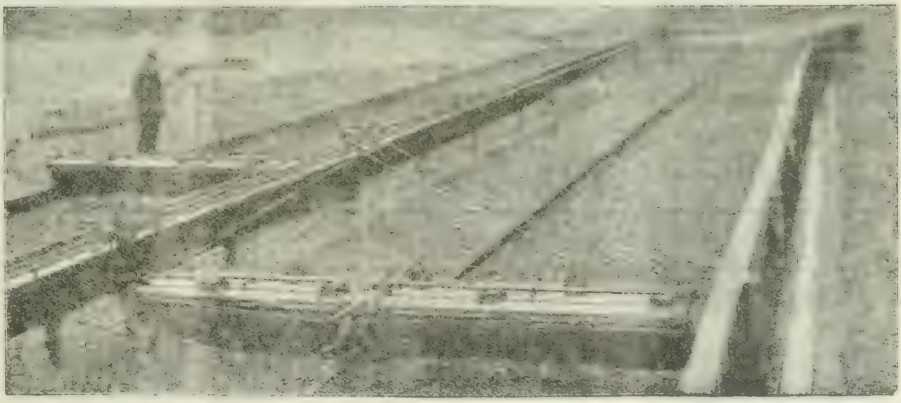
Sanitary.

Over 5,000,000 five million Square Feet in use by H.M. Government.

[illegible] product—
Address: **Thames Mills, Purfleet, Essex**
[illegible] "Boards, Purfleet."

THE FIREPROOF FIBRE BUILDING BOARDS, LTD.,
[illegible] 26 Hart Street, London, W.C.

"J. & A." Patent Sewage Sprinklers



As Fixed at Oldham, Corporation Sewage Works.

No Wind Troubles. No Complicated Mechanism. No Small Holes to Get Choked and Low Cost of Maintenance Guaranteed.

Write to-day for Illustrated Booklet Series S2.

Jones & Attwood, Ltd., Hydraulic Engineers, Stourbridge.

Telegraphic Address—"HEAT, STOURBRIDGE." Telephone No. 10.

PUBLIC HEALTH ACT, 1875.

CITY OF ST. ALBAN.

EXTENSION OF MAIN SEWERAGE: CONTRACT No. 2.

TO SEWERAGE CONTRACTORS.

The Corporation of the City of St. Alban, acting as the Sanitary Authority for the said City, are prepared to receive Tenders for certain works in connection with alterations and additions to the Sewage Disposal Works, near Park-street, on the outskirts of the City of St. Alban.

The works generally will consist of the construction of Concrete Sedimentation and Humus Tanks, Primary and Secondary Bacteria Beds, necessary Drains, Connections, &c., extension of Buildings, and alteration to existing Bacteria Beds, &c.

Particulars, Bills of Quantities, and Forms of Tender may be obtained, and Plans may be seen, at the office of the Consulting Engineer, Mr. H. Howard Humphreys, 28 Victoria-street, Westminster, after the 8th day of January, 1915, between the hours of 10 a.m. and 4 p.m.

Intending Contractors will be required to deposit a sum of Three Guineas prior to particulars being furnished, such sum being returned after the Corporation have come to a decision on the Tenders received, provided that the Contractor shall have sent in a *bonâ-fide* Tender, and shall not have withdrawn the same.

The successful Tenderer will be required to execute a Contract the draft of which may be seen at the offices of the Consulting Engineer aforesaid.

Tenders must be on the official form, each Tender in a sealed envelope (which will be provided by the Engineer).

Contractors must, with the Tender, return the Bill of Quantities and Schedule of Prices duly filled in in detail, and signed in the handwriting of the Tenderer or his authorised Agent.

Tenders must reach the undersigned not later than noon on the 27th day of January, 1915. The Corporation do not bind themselves to accept the lowest or any Tender.

Given under my hand this 4th day of January, 1915.

E. P. DEBENHAM,
Town Clerk.

St. Albans. (2,225)

BARNET URBAN DISTRICT COUNCIL.

Tenders are invited for a 10-ton Steam Roller with Scarifier.

Full particulars can be obtained on application to Mr. W. B. Chancellor, C.E., Engineer and Surveyor, 40 High-street, Barnet.

Quotations, endorsed "Steam Roller," and addressed to the Clerk of the Council, must be delivered on or before the 27th inst.

The lowest or any Tender will not necessarily be accepted.

H. W. POOLE,
Clerk of the Council.

Barnet. (2,258)

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

The Essex County Council are prepared to receive Tenders for the Year ending 31st March, 1916, for the supply of Materials, Team Labour, &c., as set out in the Schedule below:—

1. Team Labour.
2. Stoneware Pipes.
3. Norwegian Granite Kerb and Setts, York Kerb, &c.
4. Distilled Tar.

Forms of Tender, with the special envelope in which Tenders are to be delivered, and all other information and particulars, can be obtained at the County Surveyor's Office at Chelmsford.

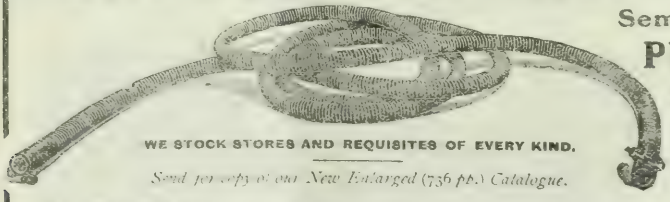
Tenders to be delivered on or before Wednesday, the 27th day of January, 1915.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

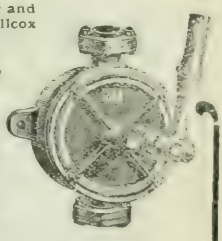
Office of the County Surveyor,
Chelmsford.
January 11 1915. (2,256)

WILLCOX'S PUMPS & HOSE

Our Jones-Willcox Patent Wire-Bound Hose contains NO Rubber, and, being wired internally and externally, cannot kink or deteriorate, neither can it perish like rubber hose. Jones-Willcox Hose is strongly built, stands heavy wear and tear, and is unaffected by Oils, &c.



Semi-Rotary
PUMPS.



Will Lift and Force Water, Tar, &c.

In Iron and Brass.
All sizes ½" to 3" connections.

WE STOCK STORES AND REQUISITES OF EVERY KIND.

Send per copy of our New Enlarged (736 pp.) Catalogue.

W. H. Willcox & Co., Ltd., Southwark Street, London, S.E.

"ENDEE" PORTABLE PETROL DRIVEN

CESSPOOL EMPTYING VACUUM SET

As supplied to important Rural District Councils.

AIR PUMPS FOR ALL PURPOSES.

Complete specification and particulars on application to the sole manufacturers:

NORMAN DICKSON, PRINGLE & CO.,

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London Office: 25 VICTORIA STREET, S.W.

Contractors to the Government.

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. JANUARY 22, 1915. No. 1,201.

Minutes of Proceedings.

Engineering and Publicity.

[illegible] Mr. [illegible] read to the Municipal Engineers' Society, Philadelphia, a paper on "Engineering and Publicity," which was discussed at the meeting of the Department of Public Works, Philadelphia. Among the points dealt with in the paper were the relations of the engineer to the community and public opinion, and the [illegible] by the engineer. Mr. Cooke [illegible] that the engineer [illegible] to be a [illegible] and that in every decision and act there shall be the [illegible] of the public welfare. [illegible] engineer [illegible] can doubtless result from this [illegible] engineer might [illegible] actions which have not only [illegible] undergone examination, but which [illegible] and in many cases [illegible] It is [illegible] from [illegible] that, broadly speaking, the test by which the ultimate position of the municipal engineer will be determined is the competence in the profession of a [illegible] part of public [illegible] In regard to the position of consulting engineers, it appears that in America, as here, some difficulty is felt with regard to the connection which [illegible] with manufacturing firms. As an illustration of this, Mr. Cooke quoted the case of an eminent authority on concrete, in intimate touch with the most progressive in the [illegible] who recently asked the chairman of an engineering firm was not in any way connected with the [illegible] manufacture of this material, and after considerable thought was able to think of [illegible] man. Although we agree that there is nothing necessarily improper in such a state of affairs, it makes neither for the true dignity of the profession nor the confidence of the public. In this country the difficulty has largely been met by the recently established organisation of consulting engineers, and it would seem that our American confrères would do well to possess themselves of a similar association.

In the latter part of his paper Mr. Cooke made some most valuable remarks on the work of the municipal engineer in influencing public opinion. Only too frequently the engineer is in the position of an enlightened pioneer in regard to some matter of health or sanitation, whose first business it is to convince his council and the public of the utility and ultimate economy of his schemes. In other words, he must be a good advocate, and his arguments must be clear, convincing, and convincing. It is only as engineers who are able [illegible] lead the public, sometimes against its will, understand their work, that they will obtain that degree of popular support which will enable them to achieve the ends they have in view. In this country an excellent illustration is afforded in the matter of housing. [illegible] Housing [illegible] by local authorities under the Housing of the Working Classes Act, 1890, were used to anything like their full extent, and, although great strides have been made in this matter since the passing of the Act of 1909, much [illegible] remains to be done. Many [illegible] still [illegible] willing to balance the public health of their areas against pounds, shillings and pence, and to indulge in petty economies which result in the greatest harm. The business of the municipal engineer [illegible] and [illegible] although in many cases it seems an almost hopeless task, that [illegible]

Burst Water Mains.

The [illegible] of leakage and waste in a pipe system are many, and depend upon the special conditions of each district or system. In one case leakage may occur owing to corrosion of the pipes, at others the trouble may be due to defective joints, imperfect connections to services, or defects in the service pipes to houses; or again a main may fail owing to some defect in the casting or structure, which was not observed when it was laid; such defects sometimes only become apparent when a great pressure comes upon the main. An investigation of the causes of forty-two breaks in the Chicago water mains resulted in a report to the effect that the leaks or breaks in the mains were due to thirteen causes—viz.: improper design, poor material, improper handling and installation, subsidence or rise of soil, jarring from traffic, frost, temperature changes, electrolysis, corrosion, excessive static pressure, excessive momentary pressure, periodic pressure waves, and extraordinary causes. The most serious cause of breaks, however, at Chicago was found to be due to excessive momentary pressure due to water hammer. It is demonstrated that the intensity of the pressure cannot be calculated with any degree of certainty, and therefore it

cannot be provided for in the design, except approximately.

Water hammer may be caused by suddenly increasing the flow in the mains, as with the sudden starting of a pump, or by suddenly shutting off the flow at the outlet end of the main. A large consumer who suddenly shuts off the flow to his premises may thus cause sudden and undue pressure to occur in the main. Some leaks at joints were thought to be due to the jar of heavy traffic. The investigations appeared to prove that certain burst pipes were made of metal of a quality and thickness to withstand the greatest pressure that could come upon them in ordinary working. The pipes had been tested when laid to 100-lb. pressure, and the greatest pressure coming upon them in working was 41 lb. A water-hammer producer, as a testing appliance for pipe brittleness, has therefore been proposed. It comprises a plunger of small size, free to move inward a short distance towards the water in the pipe while on the testing flow. The motion outward is promoted by steps. A weight on guides is fixed to fall upon the plunger. The water under the plunger is connected to the water in the pipe, the water having a static pressure equal to the working pressure in the town main. The entire pressure can be regulated by the size of the weight and by the length of its fall.

The future policy at Chicago appears to be the testing of all pipes, fittings, and valves for strength under water hammer, to protect the mains by the installation of a number of air vessels, and to require the use of such vessels in all places where there may be quick-closing valves of a size equal to one-quarter of the area of the supply pipe, and in all cases where the supply pipe exceeds 4 in. in diameter, also to lay all mains to line and grade. Whether such elaborate precautions are necessary must depend upon the nature of the system, but undoubtedly where quick-shutting valves over 4 in. in diameter exist on mains, as is apparently the case at Chicago, special precautions must be taken. Whether the increased weight of modern traffic will exert any harmful influence on water mains in this country is doubtful. Where the foundations of the main have been disturbed by other works, there is always a likelihood of trouble arising, but it does not seem reasonable to suppose that more pressure and vibration will adversely affect good pipes properly jointed.

* * *

Roadmaking and Skilled Labour.

Under the heading of "Things One Would Like to Know," our contributor last week inquired whether surveyors throughout the country are not suffering from a lack of sufficient skilled labour for road maintenance and construction. Be the reason what it may, there is no doubt that—to use the accepted formula—this question should be answered in the affirmative. It is equally true that the inevitable result of the handling of expensive appliances and materials by unskilled workmen is an element of waste of public money. An interesting paragraph in regard to this matter appeared in the last annual report of Mr. G. H. Jack, the county surveyor of Herefordshire, in which he drew attention to the common fallacy that any sort of man will do for road work, and that little or no skill is required in its execution. He then made the striking statement that there were not in his county a dozen workmen competent to act as foremen over gangs employed in the construction of waterproof roads. The reason for this shortage of competent labour is, in our view, to be found in the comparatively low wages offered. Most highway authorities have yet to learn that a wage must be paid which will attract men who are sufficiently educated to grasp quickly the elementary scientific principles of good road-making. If this were done, the extra expense would be saved many times over in reduced cost of maintenance, both of the better-made roads and of the more carefully-used appliances. As Mr. Jack pointed out, it matters little how competent the chief surveyor or his staff may be; if the men who actually do the work are untrained and consequently incompetent, the result must be both unsatisfactory and costly. It is quite impossible to get good work out of a bad workman, however much he is supervised. Good workmanship is essential for the production of good roads, and it is well worth paying for.

* * *

Concrete Roads.

The article which we publish in another column from the pen of Mr. W. W. Crosby forms a fitting supplement to the references that have appeared in our pages of late to the use of concrete in modern road construction. At the present time the choice of a form of construction adapted to the requirements of modern traffic is a problem that is constantly before the highway engineer. The use of concrete as a surfacing material made no progress in the days when animal traction reigned supreme, mainly owing to the expense and difficulty of repair. With the advent of mechanically-propelled vehicles, however, new considerations have arisen, and the voice of the advocate of concrete is again heard. Mr. Crosby's article is based upon the hypothesis that he is speaking only of city streets on which a considerable amount of animal-drawn, hard-tyred traffic is mixed with motor vehicles on rubber tyres. For such cases a concrete surface certainly has many desirable characteristics. For example, it can be maintained without the use of any expensive mechanical appliances; it is easily kept clean; has an extraordinarily low resistance to traction; and is as sanitary as any pavement, except a bituminous one. As regards first cost, however, the figure for a concrete road is necessarily comparatively high, although the excess may in part be obviated by the use of a local stone as the aggregate. The cost of repairs too must be large owing to the necessity for cutting away the material in almost every case. The burden of Mr. Crosby's article is that the advantages of an all-concrete road can be secured without the attendant disadvantages by providing a bituminous surface on the concrete. In other words, economy in the first cost of the concrete may be effected by making it of a composition suitable for foundations, and economy in repair by the presence of the bituminous carpet.

* * *

Groynes.

The protection of our foreshores is at the same time one of the most difficult and important tasks devolving upon our engineers to-day, and the whole subject has been receiving increased attention in recent years at the hands of experts and specialists. Among these, few can speak with greater authority than Mr. A. T. Walmisley, whose [illegible] article to which reference will appear in our Special Issue next week. Some of our readers may remember that a paper by Mr. Walmisley on the subject of "Groynes" appeared in our columns as long ago as 1897. In the article of which we now write he brings the matter thoroughly up to date, and provides a large number of excellent drawings, showing details which are likely to be of considerable value to those who are concerned with foreshore protection works. The primary object of groynes is to arrest the shingle upon the windward side—an object which must be attained without producing any undue scour to leeward. They thus act in aid [illegible] natural barriers which may exist against

the denuding action of the sea. There are four rainy-point to be kept in view in their construction. They should be connected at the top and with a sea wall, carried well out into the sea, constructed only at sufficient height to retain the beach, and not to obstruct the rush of water over the beach, and provided with an inclined outer edge parallel to the steam angle of the beach. Mr. Whitelegg states these principles as illustrated by a series of eight designs showing various forms of groyne construction. As regards the material to be used, he expresses the opinion that there appears to be no merit in the adoption of reinforced concrete which may suffer from the expansion of the metal to a greater degree than the attrition of the shingle. Moreover, a concrete groyne cannot be so readily repaired as one constructed in timber.

* * *

Haworth Council and the Ventilation of Dwelling-houses.

The revolt against practically improvement in general sanitary powers generally finds a most vehement expression in a section of urban and rural councillors whose opposition is almost interested or merely the outcome of obstinate humour. Lately, the Haworth (Urban) District Council have had under consideration the problem of the open window—by no means rare in the rural districts—and it was proposed at the council meeting that a resolution passed in November last with reference to the ventilation of rooms of dwelling-houses should be extended so as to include the following: "That the window shall be fitted with cords and weights so as to allow of the top and bottom sashes being opened, or, if a casement window, it shall be made to open the full length thereof, and not less than one-half of the area of the window." The proposal, it was explained, would only apply to one window in each room. The protest there is always a more serious protest launched against such propositions—on this particular occasion assumed the usual form that the proposed resolution was unreasonable, drastic, and unworkable. There was a variant, however, upon this note in the suggestion that, owing to the high altitude of Haworth, many people had the greatest difficulty during six months out of the twelve in keeping the wind out of their rooms and keeping warm. This, of course, might point to the necessity for enforcing structural repairs to the houses, and to ensure that these shall be reasonably wind-proof, but, so far from being an argument against the ventilation of the rooms by means of the movable window, it only strengthens the case for the proposition, which, we are pleased to record, was carried by a substantial majority.

* * *

Municipal Engineers and the War.

In another column will be found an article on "Camp Kitchens," being the last of the series written for THE SURVEYOR since the outbreak of war in August last by Mr. Bertram Hartfree, the engineer and surveyor to the Alton, Hants, Urban District Council. The general object of these articles, which have dealt with a wide variety of topics, has been to indicate to municipal engineers who may be called upon in an emergency to render assistance to the military authorities the general principles underlying those classes of work which are most likely to fall to their lot. In the article in our present issue the writer deals in succession with the case where a kitchen is wanted for immediate use, the provision of kitchens in connection with billets in empty buildings, and the construction of trench kitchens of various types. Finally, he deals with the most important considerations to be borne in mind in the selection of a site for a camping ground. This is, perhaps, one of the most likely points for consultation with a civil surveyor acquainted with the neighbourhood in which it is desired to settle. As Mr. Hartfree points out, the primary factor is a suitable soil, which in no case should be impregnated with subsoil water. Other important considerations are the avoidance, as far as possible, of sites recently occupied by other troops; the selection of a suitable aspect; and the provision of an area adequate to accommodate the number of troops to be provided for. In the last respect, [illegible] the side of generosity.

* * *

Sanitary Institute Lectures.

The Royal Sanitary Institute have arranged, as usual, during the forthcoming Spring a [illegible] highest educational value for sanitary officers. It is pointed out in the syllabus that the lectures are in no way meant as a substitute for the practical familiarity with sanitary work which the efficient inspector must necessarily possess. As a supplement to this part of his training, however, their usefulness cannot be gainsaid. The full syllabus comprises almost, if not quite, every branch of knowledge which the fully equipped sanitary inspector ought to possess, and the names of the [illegible] lodged expert in his own subject is alone a sufficient guarantee of the quality of the instruction to be given. The subjects in Part I. of the course include elementary physics and chemistry, public health statutes, the practical duties of a sanitary inspector, municipal hygiene, and building construction in its sanitary relations; while Part II. consists of seven lectures on meat and [illegible] of water, food, and drugs for analysis. The whole course is supplemented by a series of inspections, demonstrations, and visits to various public and private works, illustrative of sanitary practice and administration. It only remains to add that the privilege of attendance is not confined to members of the institute or to prospective sanitary inspectors, and that many of the topics to be dealt with are of direct interest to the young municipal engineer.

* * *

Flies and Health

Apropos of our remarks last week calling attention to the [illegible] report to the Local Government Board on "Flies as Carriers of Infection," it is of interest to recall that in a circular letter relating to the prevention of [illegible] the Board so early as 1908 called attention to the [illegible] In that letter it was stated that for practical purposes the number of flies in the summer months [illegible] under present conditions, of the possibilities of [illegible] by decomposing organic matter, especially in districts in which privies and pail closets persist, and in which accumulations of house refuse or [illegible] are permitted. The rapid development of flies and the necessity for the frequent cleansing of their breeding places, and it is only by vigorously attacking the pest at this source that any appreciable reduction in its numbers can be effected. The part of the ordinary householder in this warfare for health must, however, consist in the destruction of the adult insect. To this end the use of fly traps or papers should be encouraged in every possible way, and any handbills in regard to domestic cleanliness or hygiene issued either by health societies or sanitary authorities ought certainly to include directions for the destruction of flies.

C*

Madras City Water Supply.

OPENING OF NEW WORKS.

New water supply works for Madras, for the entire design and construction of which Mr. J. W. Madeley, M.A., M.INST.C.E., M.AM.SOC.C.E., special engineer to the corporation, has been responsible, were formally opened by the Governor, Lord Pentland, on December 17th last.

Originally the city of Madras obtained its water supply from shallow wells. These became polluted and dangerous to health through contamination of the subsoil water by the constant stream of sewage which was allowed to soak into the ground. Complaints were numerous, and various schemes were put forward. Eventually a proposal to obtain water from the present sources was adopted, and the works were inaugurated in 1872. This supply having proved unsatisfactory, the new works have been carried out to remedy the defects.

The Madras City water supply is part of a project undertaken with the object of utilising, to the fullest economical extent, the waters of the Corteliar River and its tributaries. This is effected by means of a masonry weir built across the Corteliar River at Tamarapakkam. This weir diverts the river—excluding the greater flood discharges—into a channel feeding the Cholavaram and Red Hills tanks which store the flood water, resulting from the monsoon rains, and render it available during the months that the river bed is dry. From the lower of these—the Red Hills tank—the Madras water supply is drawn. The water from both tanks is also used to irrigate a first crop area of 7,500 acres, and a second crop area of 3,200 acres. The water thus used for irrigation is estimated to amount to about three times the present water supply to Madras. The Red Hills tank is fed partly by rain falling on its own catchment area, but mainly from the Cholavaram tank, which, in its turn, is supplied by the Corteliar river itself, by means of the channel starting at Tamarapakkam anicut, and also by the rivers Katankal and Bosikal (tributaries of the Corteliar), which are intercepted by the same channel that carries the water of the Corteliar to Cholavaram tank.

The storage capacity of the two tanks is 2,741 million cub. ft.; the average rainfall over the whole catchment area may be taken as 57 in. per annum.

The following new works have been constructed to remedy the faults in the old works:—

(1) An intake tower in Red Hills Lake located at a point where the water is deep so that the lake can be almost entirely emptied without pumping.

(2) An underground conduit to replace the existing open channel. This conduit will prevent loss by evaporation and percolation, will convey an adequate supply of water, and will remove the possibility of pollution in transit.

(3) Sand filters to purify the water.

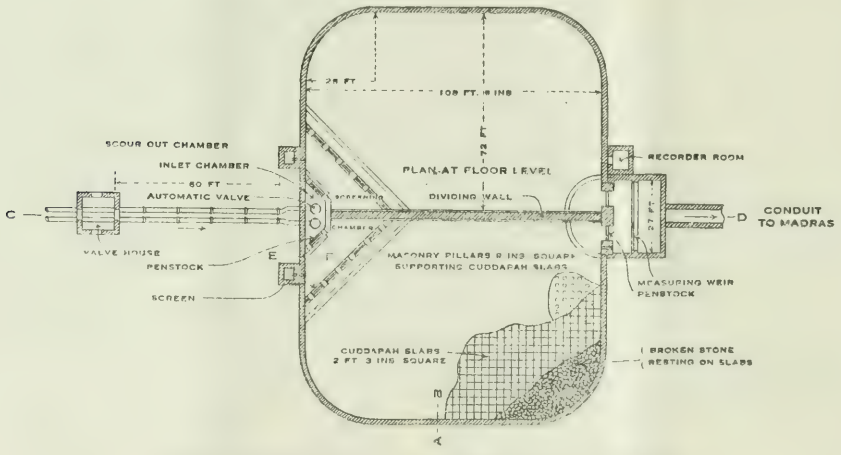
(4) Pure-water tanks to store the filtered water.

(5) Pumps to impart to the water an adequate pressure.

(6) An elevated tank to ensure the maintenance of a steady pressure in the mains.

(7) The remodelling alteration and extension of the distribution system so as to provide all the inhabitants of Madras with an adequate quantity of water under sufficient pressure.

The whole of these works—(1) to (6)—were completed by December last except for the supply of filtering materials for five filters. The most important mains of the new distribution system, together with a large number of urgently required street pipes, have been laid. The main object of the new works—the furnishing of a sufficient supply under adequate pressure—is now accomplished. The principal works remaining to be done are the completion of the subsidiary mains and distributary pipes, and the installation of waste-water detection meters. These works are delayed



Madras Water Supply: Plan of Roughing Filters (Fig. 1).

owing to the decision of the corporation to defer entering into contracts for large quantities of materials during the uncertainty which now prevails in consequence of the war.

Before construction was commenced the question of the agency by which the waterworks should be carried out was carefully considered, and it was eventually decided that the work should be divided into small sections, so that it might be executed by local contractors. This was thought preferable to importing outside contractors with up-to-date plant, machinery and methods of construction such as are used in Europe. It ensured that the money spent on the work should, as far as possible, be paid to local firms, and, further, it was considered that the work would be done more cheaply, although the time taken would probably be longer. The results have confirmed these anticipations, and the employment of local contractors has been justified in so far as the cost has been kept low; but, on the other hand, the rate of progress has been much less than it would have been if some large European firms had been entrusted with the whole of the works. Contractors with up-to-date plant and skilled foremen are very much wanted in Madras in order to speed up the rate of carrying out work.

COST.

The total estimated cost of the works is about Rs.63 lakhs [£419,958], of which works to the value

[illegible] 12 miles (19,979 yd.) have been completed. The remaining 21 miles 5 f. [illegible] are almost wholly required for the purchase and laying of cast-iron pipes, &c., which will be obtained [illegible].

It is satisfactory to be able to state that the [illegible] work have cost less than the estimated amount, and there is reason to anticipate that the whole of the works will be completed within the estimated amount, unless there is a further rise in rates in addition to the increase that has already taken place.

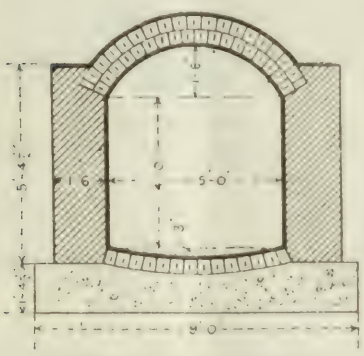
RECENT IMPROVEMENTS OF NEW WORKS.

The two 24-in. pipes from the reservoir [illegible] are passing through the [illegible] chamber, the walls of which are fitted with movable copper [illegible].

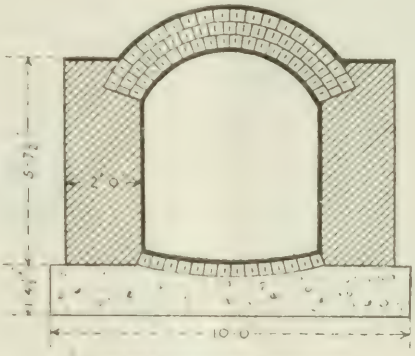
Fig. 3 illustrates a similar section of the conduit for deep excavation.

The whole of the internal surface of the conduit [illegible] with a coat of cement to [illegible] in thick, and the outside of the earth is protected with [illegible] concrete.

When originally designed it was not intended that the conduit should be subjected to internal pressure. Where [illegible] it was proposed that [illegible] pipes should be used. After careful consideration, however, it was decided to [illegible] and although the [illegible] conduit [illegible] the [illegible] pipes [illegible] the [illegible] it was decided that [illegible] should be perforated with barbed wire to take the tension.



CROSS SECTION OF CONDUIT IN SHALLOW EXCAVATION 11 FEET OR LESS TO INVERT



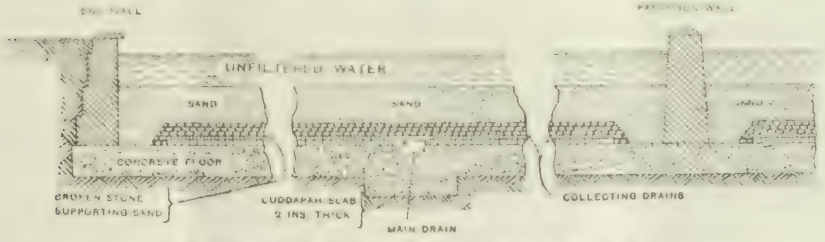
CROSS SECTION OF CONDUIT IN GOOD GROUND 11 TO 18 FEET TO INVERT

MADRAS WATER SUPPLY. [illegible] (Fig. 2, page [illegible] Note.—Interest [illegible] on the same [illegible].)

[illegible] must pass in order to reach the roughing filter.

The roughing filters [illegible] long, 108 ft. wide, and 8 ft. deep. It is divided into two compartments, each of [illegible] half may be thrown out of use for repairs or cleaning while the other half remains in use. Ordinary cleans-

Fourteen filters of the ordinary slow sand type have been constructed. The filters are arranged in two rows of seven each, it being intended that six filters of each row, twelve in all, should be continuously in operation, allowance being made for one filter in each [illegible] being under repair or being cleaned. [illegible] each



MADRAS WATER SUPPLY. SECTION OF FILTER. (Fig. 4.)

ing will be effected by reversing the flow through the filter.

The filtering medium consists of 3 ft. of [illegible] trap rock, varying in size from that which will just pass through a 1½-in. ring at the bottom to the top layer, which will pass through a ⅜-in. ring and be rejected by a ¼-in. ring.

The conduit which conveys the water from the roughing filter at Red Hills to the sand filters at Kilpauk is 7 miles in length, and has an average gradient of 1 in 4,470. Internally, the conduit is 5 ft. wide, with vertical side walls 4 ft. high to the springing of the arched roof, which has a rise of 18 in. The floor is inverted, with a dip in the centre of 3 in., so that the maximum height is 5 ft. 9 in.

A typical cross-section in shallow excavation, which applies to most of the conduit, is shown on Fig. 2, from which it will be seen that the concrete floor averages 15 in. thick, and is covered by a 4½-in. brick invert. The side walls are in brickwork 18 in. thick, and the arch consists of two rings of brickwork.

will be constructed when required. The conduit which brings the water from the Red Hills is continued round the fourteen filters, and is connected to each bed by a 14-in. diameter cast-iron pipe controlled by a valve, so that any filter may be isolated for cleaning or repair. Between the two rows of filters runs the filtered-water channel, to which filtered water from each bed can be delivered through a Glenfield-Jones automatic [illegible]. Each filter is 200 ft. long and 100 ft. wide. A typical section of a filter is shown (Fig. 4).

Below the top of sand level the walls are slightly battered, in order that the sand by its own weight may be packed tightly against the walls, and thus prevent the free flow of water between the sand and the walls. As a further precaution, neither the drains nor the broken stone at the bottom of the filters are taken right up to the side walls. The drains are stopped 3 ft. away from the walls; broken stone is placed round the ends of the drains, and the space between the stone and the walls is filled with sand.

The filtering material consists of clean, washed,

river sand, screened so as to eliminate all material except that which passes through 1/30-in. mesh and is retained on 1/50-in. mesh. Under the fine-sand layer, 28 in. deep, is a layer of coarse sand, 2 in. deep, resting on broken granite stone laid in two layers, each 2 in. deep. The top layer of stone will pass a ½-in. ring, and be retained on a ⅜-in. ring; the bottom layer will pass a ¾ in. ring and be retained on a ⅜-in. ring.

Below the bottom layer of stone are brick collecting drains, consisting of rows of best pressed bricks laid flat, 4½ in. apart, and covered by another layer of bricks with open joints. Through these drains the water makes its way to the main semi-circular drain running along the centre of the bed and sunk below the floor. This drain is 24 in. wide, and is covered by Cuddapan slabs. It leads to a rectangular filter outlet chamber.

The three underground covered pure-water storage tanks are each 150 ft. square, with a depth of 10 ft. of water, and have a capacity of 1,400,000 gallons each. The tank floor consists of 2 ft. of concrete, and the side walls are of brickwork. The roof is supported on brick jack arches, springing from steel girders resting on brick cross-walls carried by arches springing from granite stone piers. Each tank is provided with a 30-in. inlet and a 30-in. outlet, both fitted with sluice valves. A scour is also provided for emptying and cleaning each tank.

From the pure-water tanks the water gravitates to the suction culvert, whence it will be pumped into the corporation mains through a 48-in. diameter steel main ½ mile long. An elevated tank is connected with the pumping main, in order to act as a balancing tank between the pumps and the distribution system.

The pumping plant has been supplied and erected by Messrs. James Simpson & Co., of England and Calcutta. It comprises three high-duty Worthington direct-acting pumping engines, each capable of delivering 12,000 gallons of water per minute against a maximum total head of 80 ft. Three Babcock & Wilcox boilers, each capable of supplying steam continuously to any two engines working together against a total head of 80 ft., are provided.

THE DISTRIBUTION SYSTEM.

When the new distribution system was designed it was anticipated that such loans as would be required to defray the cost of the work would be subject to repayment over periods of from thirty to fifty years, according to the nature of the works, and thus it was considered that the distribution system should be sufficient for the needs of the consumers at the expiration of that period. The pipe system was therefore designed so as to suffice for all parts of the city up to 1961, when the population is expected to be 660,000.

The new supply provides for a consumption of 25 gallons per head per day, and the distribution system has been planned so as to be capable of supplying water at a rate equal to three times the average daily demand—that is, at the rate of 75 gallons per head per day. At the average rate of supply of 25 gallons per head per day the pressure will be about 50-ft. above ground level at the ends of principal mains, and additions and alterations to the existing system have been worked out to ensure this pressure.

The pipes of the distribution system vary in diameter from 3 in. to 42 in. The total length of new pipes is about 140 miles, and of old pipes retained 110 miles—a grand total of 250 miles in the completed system. The smallest new pipe is 4 in. in diameter.

HOUSE SERVICES.

Each service starts with a brass ferrule in the water main, and is provided with a brass screw-down stop-cock in the road. Lead or iron pipes may be used, but if the latter they must be properly protected from corrosion when laid in earth.

Two classes of connections have been adopted—namely, first-class and second-class. The second-class, which will apply to the bulk of the population, enables a householder to have his own taps provided they are placed in such positions that they can at all times be inspected by the municipal staff. No second-class service will be of larger bore than ¾ in. Anyone desirous of having a supply which is not open to inspection without notice may have a first-class service, which is subject to the following conditions:—

(1) The householder is required to hire water meters placed at his disposal by the corporation, to adopt specified fittings, and to secure approval of the position of pipes and taps.

(2) He obtains a full supply of 100 gallons per day for every rupee of rent, with a minimum free allowance of 3,000 gallons per month.

(3) A charge of 12 annas per 1,000 gallons is made for all water used in excess of the free supply.

It is believed that by the adoption of this method of house service, everyone in the city will have all the water which he legitimately requires, and that it will at the same time tend to reduce waste to a minimum.

PREVENTION OF WASTE AND LEAKAGE.

A waste-water meter system will be introduced into the city as soon as the requisite pipes and valves have been laid. For this purpose the city has been subdivided into 134 districts, and the mains so arranged that by closing a few valves the whole of the water required by any district is passed through a pipe on which is placed a waste-water meter.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

COUNCIL MEETING.

A meeting of the council of the Institution of Municipal and County Engineers was held at 92 Victoria-street, Westminster, on Saturday, January 9th. Present: Messrs. J. S. Pickering (president, in the chair), W. N. Blair, J. Patten Barber, J. A. Brodie, G. F. Carter, F. C. Cook, W. Harpur, T. W. A. Hayward, W. T. Lancashire, W. H. Prescott, P. H. Palmer, N. Scorgie, H. T. Wakelam, C. F. Wike, O. E. Winter, the consultant secretary, and the secretary.

THE MEMBERSHIP ROLL.

The following candidates were elected:—

Members: Messrs. E. T. Annett, assistant borough surveyor, Gillingham, Kent; J. B. Cooke, engineering surveyor to the Denton Urban District Council; W. J. Hiscox, surveyor to the Hay Urban District Council; T. H. Negus, engineer to the Meriden Rural District Council; and H. A. Newman, chief assistant to the Finchley Urban District Council.

Associate-member: Mr. F. S. Oldfield, engineering assistant to borough engineer, Battersea.

Students: Messrs. C. H. Collins, articled pupil to surveyor at Walsall Rural District Council; and W. S. Wilson, engineering assistant to borough surveyor, Chesterfield.

Transfer from Associate-member to Member: Mr. W. H. Pearce, engineer and surveyor to the Swanage Urban District Council.

LETTERS OF CONDOLENCE.

It was resolved to send letters of condolence to the relatives of the late Mr. Frank Sumner, engineer to the City of London, and of the late Mr. T. Callen.

AWARD OF TESTAMUR.

It was resolved to award the testamur of the institution to Mr. J. P. Pike, assistant to the municipal engineer of Port Elizabeth, as the result of examination held in South Africa.

CHARLES JONES MEMORIAL.

A report was received from the Finance Committee as to the method of utilisation of the fund raised to perpetuate the memory of Mr. Charles Jones. In view of the wishes of the family of Mr. Jones, and the difficulties which would be experienced in establishing a prize, it was resolved to utilise the fund for the purchase of a replica of a portrait of Mr. Charles Jones presented to the Ealing Town Council, to be hung in the council chamber of the institution.

NOMINATION OF VICE-PRESIDENTS AND HON. TREASURER.

It was resolved to nominate Messrs. J. S. Brodie, T. W. A. Hayward, and P. H. Palmer as vice-presidents, and Sir James Lemon as hon. treasurer for the year 1915-1916.

ANNUAL MEETING, 1915.

The arrangements for the annual meeting to be held in 1915 were left in the hands of the president-elect, Mr. H. T. Wakelam.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier.*

Camp Kitchens.

By G. BERTRAM HARTREE, A.S.I., Engineer and Surveyor to the Alton, Hants Urban District Council.

In providing food for soldiers [illegible] placed across [illegible] a galvanised stake driven in the ground. In the open form the cooking pot is supported on a tripod and underneath three burning brands lie radiating with their flames under the pot, the wood being pushed forward as the centre of the fire is reached. Other simple type methods [illegible] placed transversely across to carry the pot. On marshy and similar ground, where excavations have a disadvantage, two parallel rows of sods are built up with a space between for the fire. The Red Cross Training Manual advises that, in cases where a kitchen is wanted immediately, parallel rows of cooking pots should be [illegible] at such distance between rows that other pots can be supported by them.

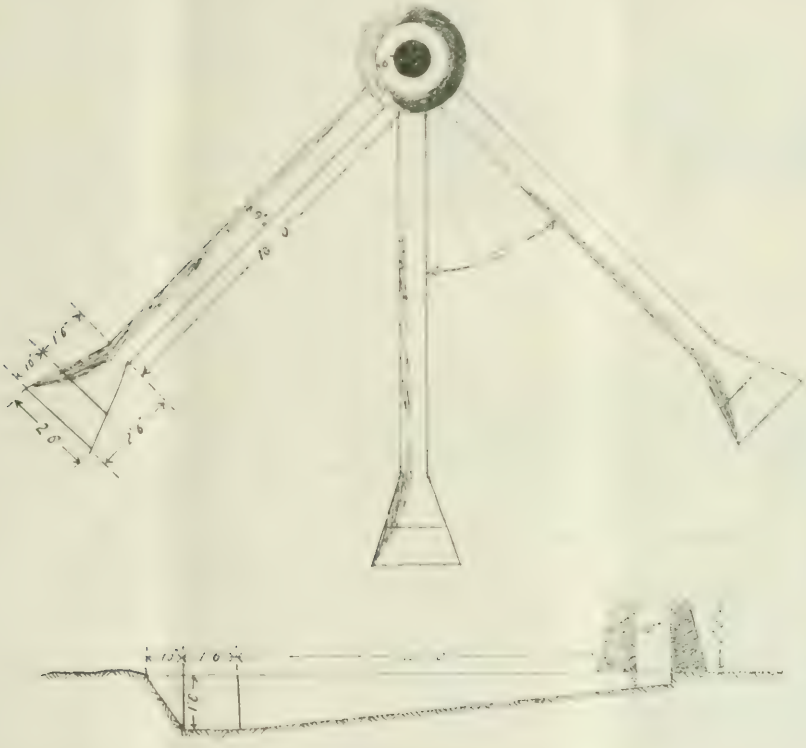


FIG. 1.

In arranging for billets in empty buildings, a common practice is to utilise three piers of bricks to support the pot, and a roof supported by four posts to protect from rain. By supplying spare sheets of corrugated iron, the camp cooks are able to make a draught to suit their purpose. A further improvement with movable sides and fixed span roof is known as the "Pent" cook-house.

In constructing a trench kitchen, the following dimensions are usually followed: Mouth, 2 ft. 6 in. wide, commencing at ground surface and tapering to a depth of 1 ft. 6 in. at a distance up of 1 ft. On plan the mouth tapers to 9-in. width at a distance back of 2 ft. 6 in., and a trench 10 ft. long continues from mouth to flue. The depth of trench is 1 ft. 6 in. at mouth, and 4 in. at flue end. The flue should be about 2 ft. in height, formed of rough sods, with an internal diameter of 12 in., and a thickness about 6in. The position of trench must allow the wind [illegible] flue. The top [illegible] broad-arrow kitchen as illustrated.

When constructing a row of trenches with separate flues the distance apart generally adopted is from 6ft. to 8 ft.

To reduce the number of flues, ofttimes a number of parallel trenches are connected to lateral trenches, and these join a main flue. This type of construction requires a transverse mouth trench 2 ft. wide and 1 ft. 9 in. in depth. To ensure good results, a branch trench should *not* join a main opposite another, and so avoid conflicting draughts. This type is known as the "gridiron" trench, and the illustration shows a four-trench gridiron. As many as twelve trenches have been found successful on this plan, subject in every case to following the rule as to direction of wind.

SELECTING A CAMPING GROUND.

The first important factor for consideration when selecting a site for a camp is suitable soil, and its suitability will be governed by its natural dryness. An earth impregnated with subsoil water is very objectionable, as at night, the temperature inside the tent being greater than outside, evaporation must take place.

In most instances, and especially under war conditions, it is advisable, for several reasons, to avoid the sites recently occupied by other troops.

In the British Isles a south-east aspect is the best, and due south is next in order. The south-west generally is to be avoided, owing to the possibility of driving rains. Low lands liable to floods must be avoided, and there is an equal objection to bottoms

of declivities that receive subsoil water from heights above. Rock or gravel are good soils, loam is fair, and clay may be equal to the latter if sun-baked; otherwise it is inferior. Heather, pasture land, and stubble fields are more suitable than long grass or ploughed land.

In considering areas, the following may be taken as suitable for units: One battalion of infantry,

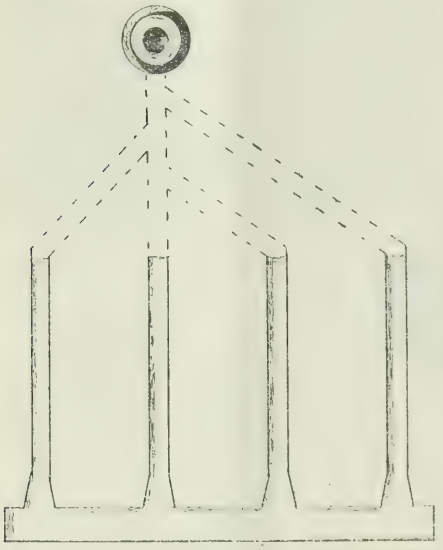


Fig. 2.

150 yds. by 120 yds.; one regiment of cavalry, 160 yds. by 180 yds.; one battery of artillery, 80 yds. by 130 yds. With larger bodies addition must be allowed for headquarters and attached services. Pending definite instructions from the military, should a civilian surveyor be acting in the matter, he should endeavour to obtain ground for double the above space, and add 30 per cent for transport, medical service, and so forth.

WHATMAN FILTER PAPERS.

At a time like the present, when consumers in the United Kingdom of all kinds of articles are seeking to replace goods previously made in Germany by those of British manufacture, it will be of interest to many of our readers to learn that Messrs. W. & R. Balston, Limited, of Whatman drawing-paper fame, have turned their attention to the production of filter paper used in analytical and technical chemistry, and have already placed on the market a grade which they claim to be fully equal to a well-known German make, and which they are offering at the price demanded for the foreign article. Messrs. H. Reeve, Angel & Co., 15 New Bridge-street, London, E.C., who have been appointed Messrs. Balston's representatives for promoting the sale of these filter papers—a number of samples of which have been submitted to us—inform us that the firm are now proceeding to manufacture the washed qualities, and that ultimately they will produce all the higher grades for which there is any demand.

Coast Sand Dunes, Sand Spits, and Sand Wastes. (By G. O. Case. Price 5s. St. Bride's Press, Limited, 24 Bride-lane, E.C.). . . . "A most useful little book crammed with facts culled from all parts of the world and well illustrated with photographic reproductions and diagrams. Numerous references to other works are given. Mr. Case discusses the formation and distribution of sand dunes and the devastation caused by them when they move inland, and then goes on to consider protective works and the reclamation of sand wastes. If we have one criticism to offer it is that the book is too condensed. There is certainly not a superfluous paragraph."—*Geographical Journal.*

HASLEMERE SURVEYOR AND HIS DUTIES.

"SUFFERING FROM BEING COMPETENT."

An unusual situation which has arisen at Haslemere with regard to the relations between the urban district council and their surveyor, Mr. H. V. Snook, was (the *Surrey Times* reports) discussed at a special meeting of the council recently. The request from Mr. Snook that the council should define his duties and hours of work arose, it appeared, because he considered that some members of the council were unappreciative of the fact that during the past year he had done a great deal of work which could not be regarded as being within the scope of his ordinary duties.

At the request of the chairman (Mr. E. Eley), Mr. A. G. Whitcher, the clerk, read the surveyor's list of duties as contained in the agreement of the surveyor's appointment, and Mr. C. J. Welland said, considering that Mr. Snook had accepted the position with certain specified duties, he did not see how they could vary the arrangement. The agreement provided that he should perform all the duties of the office, and that he should be a whole time official.

The chairman explained how the question had arisen. Mr. Snook had asked the council to define his duties and his hours of labour. Mr. Snook had done a great deal more than they might reasonably have expected from him, but what he had done had not been appreciated.

Mr. Waterston: In what way has it not been appreciated?

Mr. Snook explained that the point arose following a remark by Mr. Mills to the effect that he (the surveyor) should undertake work in connection with the drainage scheme, because he had carried out the design and construction of the new depot, and Mr. Mills said that, therefore, no payment should be made for work done in connection with the drainage scheme until such time as the plans had been finally approved. He felt very strongly on the point, because he had done practically the whole of the depot work in his own time between 6.30 p.m. and 11 p.m. He did that because they wanted the depot, and wanted to get it done as cheaply as possible, and he made no bones about doing it, even though it did mean all that work in his own time. But he did not want that to be regarded as a precedent. It must be understood that if the work was going to be of such a nature that he could not perform it in a reasonable time his hours must be defined. When getting out the plans for the depot, his hours were eight in the morning to eleven at night, and if that were going to be expected of him he should be following a rather dangerous policy.

Mr. Mills said he had not objected to extra payment being made with regard to the work to be done in connection with the new drainage, but his point was that extra payment should not begin until after the inquiry had been held.

Mr. Waterston: I should like Mr. Snook to reconsider his position.

The Surveyor: At the last meeting I produced a list of the works which had been done during the last twelve months. It is impossible to keep on at the same rate with the routine work of the district going on at the same time. I suppose we are rather an ambitious little district, and we have done a great deal of work. The report I made with regard to the drainage took me five days of levelling to see how best we could drain the district, and it necessitated nearly 1,000 inspections. That is all in addition to the ordinary routine work.

In the course of further remarks, Mr. Snook said he thought that the extension of headings at the waterworks did not come within the terms of his appointment.

Mr. Mills pointed out that one of the conditions of the appointment was that the surveyor should carry out the instructions of the council. If there were too much to do the surveyor ought to have temporary assistance during the time of pressure.

The Chairman: That is not the point, Mr. Mills. You have got hours for opening and closing up shops, and what Mr. Snook asks is that the hours should be defined during which he is at the council's service. No one can expect him to be at the beck and call of the council for the twenty-four hours of the clock.

Mr. Mills: I do not object to the hours being fixed, but what I do object to is the absolute refusal to carry out the waterworks headings.

The chairman said that was the work of a civil engineer. If they had a surveyor who had the brains

and the question to be considered is whether or not the men are to be permitted, but they were not entitled to expect him to give both those matters consideration and then not be questioned.

Mr. Mills: I have never been questioning the question when the contracts have been.

The Surveyor: I really cannot see that I can be more explicit. He asked that the hours of the men employed for the council should be reduced from 54 hours in his position.

Replying to a further statement by Mr. Mills, the surveyor said he did not intend to be discourteous with the questioning of the members, but he did not like to be cross-examined in the manner.

Mr. Mills said he did not mean to be unreasonable at all. He thought the surveyor could have come to the point long ago and saved the time. One thing he did not like was the manner of the surveyor at the last meeting when the council really only wanted all the particulars for 14 days.

Replying on other questions, the surveyor said the office staff now have from nine to five and one to two on Saturdays. In answer to another question he said he would be more than glad not to have to be called out at midnight or at three or four in the morning to the fitters on the pier, should any emergency arise, but when he signed that he should be able to do the ordinary work of the council in a reasonable number of hours in the day.

On the motion of Mr. [illegible] it was agreed that Mr. Snook's hours should be from nine to five and none to see the Saturdays.

Mr. Snook thanked the council, and said he was quite prepared to compromise the work of collecting the water leading question that if it necessitated his taking up a lot of time the council would not feel that he was breaking his contract with them in asking for [illegible] assistance if he found the work too great.

SOME RECENT PUBLICATIONS.*

Liverpool Town Planning and Housing Exhibition, 1914. Liverpool: Corporation. Edited by S. D. Adshead & Patrick Abercrombie. 9 in. 7 in. 64 pp. Liverpool: The Daily Post Press.

The Town Planning and Housing Exhibition which is now being held at Liverpool [illegible] March will be well worth the consideration of any member who is desirous of keeping in touch with the most practical side of the movement that has taken place in recent years, which has led to the [illegible] hands of the larger constituency which could not be present. [illegible] the exhibition have been selected by the chairman of the committee responsible for the [illegible] was divided. It would be difficult elsewhere to find within so small a compass the opinions of so many acknowledged experts on the wide variety of topics which come within the province of the modern improver of a modern town.

Cement Croutins.—Mr. A. Rollins, M.Inst.C.E., engineer and surveyor to the Liversedge Urban District Council, desires information relating to contractors or others who possess a process of cement-grouting foundations who would be willing to quote for some work in Liversedge.

Association of Somerset Surveyors.—The autumn general meeting of the Association of Somerset Surveyors will be held at the Merchant Venturers' College, Bristol, to-morrow (Saturday), when the following business will be transacted: (1) The election of president and officers for the ensuing year; (2) to ballot for the election of members on the Executive Committee; (3) president's address; (4) presentation of premiums to any other business. The president-elect—Mr. F. W. Jones, [illegible] invites all members to tea at the conclusion of the business. Subsequently a short convivial gathering will take place, and all members are requested to assist in this direction.

* Any of the publications noticed can be procured through, and forwarded by the "S. E. & I. Press, Limited," on receipt of published price, plus postage in the case of [illegible] books.

REFUSE DESTRUCTION IN AUSTRALIA.

MELDRUM INSTALLATION FOR NORTH SYDNEY.

[illegible] Meldrum [illegible] of the [illegible] Meldrum Destructor Company, Limited, Manchester, [illegible] Australia, [illegible] the [illegible] North Sydney [illegible] Council, [illegible] are now [illegible] and [illegible] working.

North Sydney Destructor.

The plant is the Meldrum [illegible] type, and is fed [illegible] hopper feeders, each [illegible] charge of refuse [illegible] The actual [illegible] has been 1s. 7d. per ton.

Interior of North Sydney Destructor.

It is proposed to utilise the [illegible] in connection with an adjoining tar plant and for other municipal purposes.

[illegible]

Tramways and Light Railways.—The annual report of the Board of Trade respecting tramways and light railways under Order in Council for the year 1913 shows that [illegible] and light railways in the kingdom [illegible] and [illegible] March last 2,707 miles [illegible] having increased from slightly under £4,250,000 to nearly £81,000,000.

Concrete Roads *v.* Concrete Foundations.

By W. W. CROSBY, Baltimore, Maryland.

For the sake of making clear the statements to follow, let it be assumed primarily that a "concrete road" is one in which the artificial surfacing for the roadway is built of a concrete composed of hydraulic cement, sand, and gravel or broken stone, all of predetermined proportions, and is *not* covered or protected from wear by a carpet or coating of appreciable thickness of pitch and other material. Then all those roadways of which a cement concrete layer is covered by a carpet of pitchy material will naturally fall together into another class where a "concrete base" or "foundation" supports a wearing surface composed of block paving, sheet or rock asphalt, bituminous carpets, &c., and in the consideration of these instances of the use of concrete the latter will be referred to as the "concrete foundation." Further, it should probably be understood that in writing the following the author had in mind when he referred to a road or street those public highways on which a considerable amount of animal-drawn and of hard-tyred traffic might be expected, along with motor traffic carried on rubber tyres. In any case, where the road-crust is not open to use by an appreciable amount of the former traffic, some of the remarks made might have to be considerably modified.

The use of concrete for both road surfaces and road foundations is not new. Thirty or more years ago the concrete road (in the above-described sense of the term) was "discovered," tried out and abandoned. It was found to possess certain inherent defects, and under the then existing conditions these proved so serious that its economical use was found to be limited so as to result in the practical abandonment of this form of surfacing for the time being. With the changed conditions now existing the use of concrete for roadways has again begun. The increase of traffic has demanded stronger roads. The reduced ratio of horse-drawn to total traffic has changed the average character of the stresses on the surfacing material. The immense reduction in the cost of "hydraulic cement," and the improvements in machinery for mixing and placing the concrete have aided the latter to compete with other road-crusts in first cost, and also in long-run costs. And it seems to the writer that, under the changed conditions, there are at present many cases where existing circumstances, such, for instance, as poor natural foundation for and heavy traffic on the roadway, or convenience in the supply of materials for concrete, justify, or even demand, its selection for at least a part of the road-crust. On the other hand, the tendency of certain road authorities and others to rush to "concrete" as a panacea for all road ills is to be deplored as both irrational and extravagant. In these days the great problem for road authorities is the proper selection of the form of construction best suited for the circumstances of any particular case, and a sufficient variety of surfacings, including concrete, is now available to permit true economy to be had by a proper choice.

Of the factors influencing the decision for or against the selection of concrete as the road surfacing may be considered: "Cost (first and long-run), durability, ease of maintenance, cleanliness, resistance to traction, slipperiness, sanitariness, acceptability, favourableness to travel."*

COST.

Only too frequently this consideration is limited to first cost, and fails to include, as it should, the interest charges on first cost and the cost of maintaining the pavement in as good condition as when first completed (or a "depreciation charge"), in order that a fair comparison may be drawn. Concrete can never be as low in first cost as macadam under the same conditions, because of the introduction into the former of cement, for which an additional cost has to be met. Ordinarily, though competition may be had—often successfully—by a proper assumption that a less thickness of concrete will be as strong as the macadam to be prescribed, and, further, that it is frequently possible to use in the concrete a local material for the aggregate which may be secured at a smaller cost than necessary for a proper stone for the macadam. A local granite may make an excellent concrete when it would prove entirely unsatisfactory, because of its lack of binding qualities, for macadam, and if macadam were to be built the cost of importing a suitable stone might offset the additional cost of making concrete from the local granite.

In the same way, where small, sandy gravel is plentiful in a locality, and good stone for broken stone macadam is required to be imported at a considerable expense, frequently gravel-concrete roads, or gravel-concrete foundations carrying a bituminous surface, will be found to be the economical solution.

Contrary to the arguments of many of the advocates of concrete roads, a concrete surfacing is not "permanent" in the sense that it will last indefinitely without repair. It is unfortunate that in the advocacy of modern road improvement the use of this word "permanent" has been so indiscriminate. No road surface is permanent. All require repairs from time to time if they are to be kept continuously in good condition, and the use of the word "permanent" in the arguments for better roads has been deceptive. Its abuse has produced disappointment, frequently a reaction against the movement, and often extravagance in later expenditures. It is questionable whether or not the cement manufacturers themselves, to whom many of the arguments for concrete roads may be traced, are working for their best interests in the end by their reference to concrete as "a permanent road" surfacing.

Concrete roads, in addition to the interest charges to be figured in their long-run cost, require continuous expense for maintenance and repair. Except, possibly, in those cases where a kerb adjoins the edges of the concrete roadway, the shoulders (even if the concrete itself does not) begin the day after the completion of the roadway to need maintenance. The usual sudden transition from the rigid concrete to the softer shoulder material produces, under the first heavy vehicle that in passing turns out and off the concrete, a depression or rut along the edge of the concrete. This depression or rut is a vulnerable spot in the armoured roadway, and must be immediately protected by repair against serious consequences from the entrance of water, or from material damage to the edge of the concrete itself. These points of weakness, which also are likely to occur between the earth shoulders and any road surfacing, are, in the case of concrete roads, more frequent and of greater extent, because of the greater difference in rigidity between an earth shoulder and the concrete than between the same kind of shoulder and a gravel road, for instance. While the shoulder maintenance may not be a part of the maintenance charges for the concrete itself, it certainly is a part of the road maintenance, especially where, in order to keep the first cost down, the concrete surface has been built too narrow in width to carry on it all the traffic, and a considerable portion of the latter constantly turns out on the shoulders. Certain road authorities have seemed frequently to neglect, in deciding widths or character of surface to be built, a proper consideration of the comparison between shoulder maintenance costs and interest charges, plus surfacing maintenance costs, with the results of dissatisfaction to the road user and excessive costs in the end to the contributors.

The concrete surfacing itself will, after a period dependent, of course, on local conditions, require repairs, and it is an inherent difficulty of concrete that repairs to it are not easily made. This fact was one of the main reasons for the abandonment of the earlier efforts to use concrete for road surfaces. While these repairs may seem in some respects relatively slight, the expense for them will be inversely large.

Reliable figures of cost for maintenance of concrete roads are not as yet at hand, but the foregoing may serve to indicate, from the point of view of cost, the factors to be considered in this connection, and the points of weakness in some of the arguments that have been advanced for the more general adoption of concrete road surfaces.

* See "The Scientific Selection of Pavements," *Municipal Journal and Engineer*, New York, May 29, 1913, p. 737.

[illegible] ability to wear uniformly, and this is frequently, if [illegible] even if slower, rate of wear. The difficulties in the [illegible] deliver a uniform product, that there is frequently [illegible] that there often is variation even between the pro[illegible] less irregular, and segregation and other causes for non-uniformity generally arise during the mixing and placing of the concrete. All these contribute to [illegible] surfaces of spots of unequal abilities to resist wear [illegible] of proper repair [illegible] tions to this type of pavement.

[illegible] vision does reduce to some extent the lack of homogeneity in results, certain inherent irregularities can only be reduced by mechanical means, while certain others seem inevitable. For instance, the natural irregularity in position of the stone in the [illegible] considerable extent by rolling, so that, just as in good broken-stone macadam, the majority of the [illegible] macadam. Harrowing a layer of broken stone will [illegible] of stone in the surface. Hence there seems to be [illegible] of a concrete road surface formed by grouting the broken stone, spread and rolled in place. Further, the mechanical bond thus secured between the stone particles is worth considering as an additional factor for strength and durability.

[illegible] tory. In the first place the difficulty of remedying a slight depression worn into the surface under traffic generally leads to letting such a defect increase to material dimensions before attempting its repair. [illegible] depression with any degree of surface smoothness [illegible] made, sufficient to provide space for placing in it aggregate of the same size as that which forms the adjoining surfaces and flush with them. Also, it is necessary that the new concrete be of uniform thickness, not tapering off at the edges. This means that for the proper repair of a hole the old concrete must be more or less cut away—a rather expensive proceeding. Even then a good bond—a thing by no means frequently secured between the [illegible] and the old concrete, the joints in the surface soon become objectionable. When the ordinary concrete road surface begins to need repair, it is practically only a question of a short time when the concrete surfacing will have to be abandoned as such and turned into a concrete foundation, because of the difficulties of repairing the concrete so as to leave it satisfactory as a road surface.

If a concrete road is built of gravel, notwithstanding that the average greater strength of gravel concrete is greater than with broken stone concrete, the lack of mechanical bond obtainable from the rounded stones in the surface renders the latter particularly susceptible to damage by the shod feet of draught animals. The blow of a horseshoe may break the cementing mortar around a stone, and the pushing or twisting of the foot may then easily dislodge the stone from its place. Of course, the adjoining stones are then more easily dislodged, and the hole in the surface grows rapidly and needs repair.

The difficulties of proper repair are so well recognised that many engineers are now recommending such work to be done with bituminous concrete instead of cement concrete; but, of course, this is only a step toward the ultimate transformation of the "concrete road" (surface) into a "concrete foundation."

Again it seems pretty generally agreed that concrete roads are liable to objectionable cracking under the influence of changes in temperature and the conditions regarding moisture present. After being placed the wet concrete shrinks considerably in setting and drying, and this change of volume produces cracks in the surface. These cracks form points of weakness and *foci* of deterioration more or less serious, according to their distribution and concentration. The effort is usually made to concentrate them in regularly occurring "joints," and these joints are predeterminedly built in place with cumbersome iron or steel plates which themselves are objectionable to traffic. These "expansion joints" increase in obnoxiousness as the road gets older and wears down, and ultimately, in order to relieve this feature, if for no other reason, the coating of the whole road with a bituminous or other surface or pavement is necessary. If these "expansion joints" are not provided in the first place the concrete road surface develops cracks irregularly under alternate wetness and dryness, or heat and cold, and these cracks break away on their edges and ultimately develop into objectionable places in the surface. Apparently the only remedy then is to cover the entire surface with a carpet or pavement. The "concrete road" then becomes a "concrete foundation," and if it can be foreseen that such an end is [illegible] believes that reasons of economy demand its careful consideration before reaching a decision to attempt the concrete road construction in the first place.

[illegible]

Special machinery is not required for maintaining [illegible] advantage over such pavements as bituminous concrete and sheet asphalt. Heaters, mixers and unusual tools are not required, nor even steam rollers, for at least any but the largest jobs.

[illegible]

[illegible] clean. They are, perhaps, less susceptible to dustlessness and thorough cleanliness than is an asphalt surface or the best brick pavement; but, on the other [illegible] than [illegible] ordinary good stone block pavement.

[illegible]

This is extraordinarily low in the cases of concrete pavements, and few pavements go ahead of them on [illegible]

SLIPPERINESS.

Concrete pavements are generally more slippery than macadam and stone-block pavements (except in those cases of the latter where the joints are filled with cement mortar), but less so than wood, asphalt, bituminous pavements generally, and well-laid brick pavements.

SANITARINESS.

Concrete pavements are slightly less sanitary than bituminous surfaces and pavements, are equal in this respect to the best-laid brick, and are more sanitary than stone-block pavements or macadam.

ACCEPTABILITY.

—*i.e.*, the bases of personal or local preferences, and of æsthetic consideration and of noiselessness. As before referred to, the writer is aware that at present there exists in many minds a prejudice more or less strong toward the selection of concrete for the road surface regardless of facts. That the propriety of this state of affairs may sometimes be successfully questioned he has attempted to show. As to æsthetic considerations, it may be noted that the glaring effect of the mortar in the concrete is frequently objectionable even when dark-coloured stones are used for the aggregate. On the other hand, a light colour of the concrete may be beneficial for unlighted roads through woods, especially where there is much travel at night. As to noiselessness, concrete pavements offer slight objections on this count. They are productive of more noise than bituminous surfaces and pavements, or than macadam, but of less than brick or stone blocks.

FAVOURABLENESS TO TRAVEL.

Concrete pavements are somewhat less favourable to travel than macadam or bituminous surfaces and pavements, and more favourable than stone blocks or brick in that their surface rigidity lies between the two types mentioned. An extremely rigid, inelastic

surface is objectionable to passengers over it, even when the vehicular devices for lessening the inevitable shocks are of the highest efficiency. Animals naturally prefer the softer materials on which to tread, especially when unaccustomed to metalled or paved roads. As the proportion of surfaced or unsurfaced roads increases, the latter objection to concrete is somewhat reduced. Complaints have reached the writer from motorists using newly completed stretches of concrete roads that an unpleasant vibration was noticeable to the passengers in going over such roads, and it seems probable from the descriptions and the writer's own experiences that such vibration was due to minor unevennesses in the surface unnoticeable to the eyes or at low speeds. If the speed be high enough this vibration can be detected on the best concrete roads, though it seems imperceptible on macadam or on good bituminous surfaces and pavements.

Those who lean toward "concrete roads" (using the term as, perhaps, it is more loosely and generally now applied) may attempt to meet the objections offered above by the writer to concrete roads under his definition of the term by suggesting, as is so frequently done, that the removal of nearly all grounds for objection and a considerable strengthening of the arguments for the more general use of concrete for roadways may be had by providing a bituminous surface on the concrete.

Now this point is the rock on which it appears that so many commanders of the good ship "Economy and Efficiency" have come to grief. If the concrete layer is finally to be treated as a foundation, why go to the extra expense necessary for even fairly successful use of it as a surfacing? Why make it a 1:2:4 mixture if a 1:3:6 has been so often satisfactory? Why pay for floating and otherwise finishing its surface if this can be just as well avoided by finally surfacing with a bituminous material? Why bother with, and pay for, unnecessary expansion joints? Foundations seldom have required them.

The reasons for separating the consideration according to the definition proposed at the beginning by the writer he hopes may now be apparent. After all, when a concrete layer is to be covered by a bituminous carpet, or by a block pavement, are not the considerations regarding the concrete those old ones of sufficient thickness and strength to enable it to perform its purposes, of its composition with gravel or broken stone as may be desirable for economy in first cost, and generally and identically those of any concrete foundation or base for a road surface? And then, as regards the surfacing layer, are they not the same old ones of character, of thickness, of composition—all to fit best the local conditions?

There certainly is room in the practice of highway engineering for the better and more scientific selection of road crusts. Many are, doubtless, familiar with instances of good pavements that have satisfactorily survived many years on a cheap gravel or sand foundation with only reasonable charges for maintenance, and as familiar with other cases where economy would evidently have been had from the installation of a concrete foundation in the first place. It really seems to the writer that the far larger part of the consideration concerning "concrete roads" (using the term in its broadest, and perhaps at present more general, sense) were composed of two main parts—first, as to the advisability of providing a concrete foundation for the surfacing, and, second, the determination of the character, composition and thickness of the latter.

If highway engineers will but regard the facts in the matter calmly and conservatively, and proceed carefully and steadily past the siren songs of the cement-concrete promoters, the writer feels that time and money will be saved, and that their reputation as engineers will be enhanced.

Roadmen's Wages in Ayrshire.—It was reported to the Northern District Committee of the Ayrshire County Council recently that the surveyors had drawn attention to the difficulty they were experiencing at the present time in connection with their road surfacemen leaving for other employment where better wages could be obtained. After consideration by the Works Sub-Committee it was agreed in the special circumstances to grant a general increase of wages to the men whose wages were under 5s. per day, to take effect as at next pay, the increase to be a minimum of 2s. and a maximum of 3s. per week.

BRIDGE CONSTRUCTION IN BOLIVIA.

JUNIOR INSTITUTION OF ENGINEERS LECTURE.

At a meeting of the Junior Institution of Engineers held recently, Mr. Chas. W. Glover, jun., spoke upon the subject of "Bridge Construction in Bolivia."

In the course of his remarks Mr. Glover pointed out that the high cost of bridge material in Bolivia is due to the enormous distance over which material has to be shipped, and to the difficulties experienced in transporting cumbersome girderwork. All bridge material is imported from the United States or Europe, and costs anything from twice to three times the corresponding London price, dependent, of course, upon the location of the site. Native labour, both male and female, is, however, cheap; for natives, when working on contract, will execute approximately as much work as an English labourer for half the latter's pay in England. Supervision is, however, expensive, as this can only be entrusted to white employees.

Evidence of very small stone spans constructed by the Incas still remain, but the Spanish invasion of 1631 marked a new era in bridge construction, and at present bridges of all classes, but mostly of small span, are to be seen in every town or village. Owing to the mountainous nature of the country very heavy vehicular traffic is not encountered, and the road bridges are usually of quite primitive and light construction. The small suspension bridges at the approaches to the Yungas district and the larger suspension bridge on the Potosi-Sucre coach road are examples worthy of note. Heavy bridge building is therefore practically confined to railways.

It is with the design of abutments that the greatest troubles are experienced, the attendant difficulties being usually traceable to the proximity of "mazamorra," or mud river. In Bolivia the "mazamorra" occurs most frequently on the Oruro-Cochabamba line, where seventeen big "mazamorras" are crossed in a distance of 37 kilometres (23 miles).

When properly drained and sun-dried these "mazamorras" are quite hard, and present foundations which are apparently quite firm, but a ten minutes' rain storm is often quite sufficient to render each a huge moving mire which will carry away any bridgework unwarily constructed upon it in the dry season. Piling for foundations is not practicable owing to the frequent occurrence of rocky boulders, which intersperse this "mazamorra" material, and blockwork foundations constructed upon it seldom settle, but often indicate lateral motion.

Owing to the "heaping up" effect described, "mazamorras" will often completely bury bridges constructed to span them. Under-bridges have in many cases been substituted by over-bridges, or timber chutes, but each have proved to be quite inadequate to cope with the enormous load imposed upon them. Masonry "cut and cover" structures have been suggested, but have now been superseded by the reinforced concrete tube, well anchored, and so constructed as to carry the railway through the "mazamorra."

Reinforced concrete construction, thought the speaker, will in future be greatly developed in Bolivia. Skilled labour and good supervision for this class of work is, however, not easily obtainable, and this, coupled with the fact that Portland cement is so dear (£1 to £3 per barrel of 400 lb.), offers the greatest obstacle to the development of reinforced concrete construction.

Mr. Glover illustrated his remarks with lantern slides made from his own photographs.

Chiswick and Motor Traction.—At the last meeting of Chiswick Urban District Council, Councillor Harvey spoke of the difficulty experienced by the local authority in obtaining horses. The only animals they could get were those termed "Army throw-outs," which were of no use to the council. Horses could not be hired because they could not get the men with them. The council had three horses sick at present, and the Horses Sub-committee thought the council should seriously consider the question of motor traction in the future, as no doubt horses would fetch a very big price. The chairman, Mr. J. Leith, J.P., suggested that a special committee should be appointed to consider the matter of motor traction, and this the council agreed to.

The Purification of Waste Liquors from Fellmongers' Yards and from Tanneries.—(3.)

By G. BERTRAM KERSHAW, M.Inst.C.E., M.Inst.M.E., Late Engineer to the Royal Commission on Sewage Disposal.

[redacted]

Both trades are met with in [redacted] small, throughout England.

In fellmongering [redacted] fellmonger to deal with sheep and lamb skins, removing the wool, the skins being then dispatched to the tanner to be further dealt with.

Methods vary somewhat in individual yards, a very [redacted]

[redacted] to soften them and to remove blood and dirt. When the business is carried out on a large scale, the skins [redacted] They are next either placed in brick pits containing milk of lime, or painted on the flesh side with lime [redacted] of arsenic sometimes being used in conjunction with lime. The skins are then taken in twos, laid together [redacted] twenty-four hours.

The effect of the lime is to dissolve the roots of the wool, so that it can be pulled off by hand, and the skin scraped clean. Formerly, the skins were hung up in a damp, warm room to induce putrefaction, [redacted] apt to cause damage to the skins when the wool is removed. The flesh removed from the skins is usually sold for making gelatine and glue. The skins, or [redacted] and "plunged" with wooden rods. In cases where the skins have to be sent some distance to the tanner, they receive a further soaking in lime water for three to four days in order to preserve them.

The liquors resulting from fellmongering consist of "soak" water, sometimes water from the "burring" machine, liquor from the lime pits (or "limes"), and liquor from the washing of the skins, together with a mixture of the various liquors which drip to the floors from the skins while they are being handled. All these liquors are of a grossly polluting character, but especially those discharged from the "limes" [redacted] renewal. Formerly the limes were used for a considerable time before being renewed, but it was found that this was detrimental to the skins, and the usual period for which the lime pits are now run is from two to four days.

The combined wastes contain large quantities of dissolved and suspended organic matter, taking up large quantities of oxygen very rapidly if discharged into a stream; they also contain large amounts of lime salts, together with much fibre.

Fellmongers do not use anything like the volume of water required by tanners, a [redacted] turning out perhaps [redacted] daily. As a general rule, most fellmongers' yards are situated in towns, and in such cases the question arises as to preliminary treatment prior to admission to the town sewers.

Undoubtedly the mixed wastes should be carefully settled in large catchpits or small settling tanks, which are kept carefully attended to, and cleaned out when necessary. Moreover, a suitable screen should be provided to intercept wool fibre, which, in conjunction with the precipitating action brought about by the lime salts, is very apt to cause trouble by rapidly silting up sewers, especially if they happen to be of small diameter, and [redacted] a shallow invert flow normally.

Turning to isolated cases, where the fellmongers' yard may be situated far away from sewers.

In such cases good settlement in tanks would be advisable for preliminary treatment, followed by filtration through percolating filters, or treatment upon land, if this can be obtained and of suitable quality.

In either case a low rate of filtration would be essential with such a strong liquid—probably little in excess of some 25 gallons per cube yard per twenty-four hours. The sludge has a certain manurial value, but it is difficult to dispose of in towns.

With regard to the arsenic frequently present in the combined waste liquors, and the likelihood that it may exercise a sterilising effect upon filters, this point will be touched upon in the tannery section, from which it will be seen that certain experiments have demonstrated fairly conclusively that this is not likely to occur.

In conclusion, it is well to bear in mind the fact that most fellmongering businesses are small, and [redacted] purification works.

[redacted]

[redacted] quently been the cause of trouble arising from pollution of streams in many localities. Various tanning substances are used—viz., chrome, oak, wattle, sumach and other barks, oil, alum, &c., certain tanning materials being better suited for producing particular types of leather than others.

Dealing with the oak-bark process first, the procedure to which the skins (usually bullock hides) are subjected before the tanning process proper, consists in soaking them for from two to eight days in small brick tanks, measuring about 6 ft. by 4 ft. by 4 ft. deep, filled with water. This process is termed "soaking." The skins or hides from abroad, when they arrive at the tannery, are often very hard, some being sun dried, while Continental and American hides are salted, and the "soaks" soften the hides, removing the salt* from the salted ones and the blood from fresh hides received direct from the butchers. The water in the soak pits is changed from time to time when it becomes too foul.

After leaving the soak pits the hides are placed in pits containing lime water, where they remain for from about six to twenty-four days, according to the nature of the particular batch of hides being treated. This liming process has the effect of swelling the hides or skins, making them soft and flaccid, so that the hair is loosened and the pores of the skin opened, allowing the subsequent tanning solutions to permeate them better. The contents of these lime pits, or [redacted] they are infrequently emptied, except in hot weather.

After the skins are removed from the lime pits, they are placed on a "beam" and scraped on both sides with a blunt two-handled scraper resembling a carpenter's draw-knife, this process resulting in the removal of the hair, lime and grease. In the case of skins intended for soft leather, a "pure," or "bate," is employed, these consisting of fermenting solutions of dog dung and pigeon or fowl dung respectively. The action effected by this treatment appears to be very largely bacterial, and it renders the skins flaccid.

After rinsing the skins are now ready for the tanning process proper, being first suspended in pits in the tanning liquor, and subsequently laid flat in pits with a layer of tanning substance between each skin. The duration of the tanning process varies from two to four days to as much as six to eight months for high-class sole leather.

The waste liquors produced are very polluting, particularly those derived from the liming and puring, and their treatment is a matter of some difficulty. Messrs. Wilson & Calvert, in their book on "Trade Waste Waters,"† give, among others, figures for three "hour average mixed refuse" samples, as shown in the table which appears on the next page.

The figures show the polluting nature of the mixed [redacted] before discussing their treatment, it may be well to mention briefly another process which is very largely used in this country—namely, chrome tanning.

In the process of chrome tanning, used for goat and calf skins, the skins, usually in batches of about fifty, are soaked in brick tanks for about six hours, during

* Naphthalene is sometimes used in the case of [redacted] hides.

† Chas. Griffin & Co., Limited, London.

which time they receive about three changes of water. They are next placed in brick* tanks containing lime and water (and sometimes a little sulphide of arsenic), where they remain for about three days, lime being added from time to time.

De-hairing of the skin is the next process often effected by special machines provided with a fluted brass roller which removes the hair. After de-hairing the skins are placed in wooden vats containing a solution of lime and sulphide of sodium, which is used to give certain qualities to the leather. The skins generally remain in this solution for about twenty-four hours. After the sulphide bath the skins go to the "beams" to be scraped; they are then washed in revolving drums for about thirty minutes, running water being used.

After being drummed, the skins are placed in a wooden vat containing dilute acetic acid, after which they are washed again and transferred to the tanning solution, which is composed of reduced bichromate of potash and sulphuric acid, the solution being applied to the skins in revolving wooden drums. The skins remain in the chrome drums for about five or six hours, when the solution is nearly exhausted, and it is run off to waste.

After tanning the skins are bluish-green in colour when wet, but they become white on drying. In some tanneries a hypo-sulphite solution is used after tanning to neutralise any acidity. Dyeing is effected after the tanning process, black or yellow dyes being most frequently used, the skins being washed once before dyeing and several times subsequently. The skins are next squeezed by a special machine, in order to express the water, and they are finally shaved by another appliance.

The liquors resulting from the soak and lime pits, de-hairing, first waste-waters, sulphide bath and tanning, are all of them polluting, the actual degree of pollution varying somewhat, according to the length of time a particular liquor has been in use. There is also a considerable quantity of foul liquor draining off from the floors, derived from the handling of the dripping skins when removed from the several processes.

Many other tanning processes are employed—*e.g.*, oil tanning in the manufacture of chamois leather and buckskin, cod-liver oil being used and forced into the skins, when they are stored in a warm room and afterwards placed in a weak solution of alkali. Alum tanning is used for glove leather (as at Yeovil), alum, flour, and yolk of egg being drummed into the skins, after which they are scraped and dried. When dyed leathers are required, aniline dyes are now very largely used, together with log-wood and fustic, and mordants are often used for fixing purposes.

Coming to the volume of waste liquors discharged from tanneries. A medium-sized tannery will possibly use some 20,000 gallons of water daily, but the quantity varies greatly, and it may be as little as 2,000 gallons to as much as 80,000 gallons daily. Further, it must be remembered that the mixed wastes are most polluting when discharged into a river or stream in their crude state. The lime liquors and the tanning substances, it is true, tend to neutralise one another and cause a copious precipitation, but this needs to be carried out in properly designed precipitation tanks, and not allowed to take effect on the bed of the sewers. The effect of tannery wastes on streams containing iron is to blacken the bed of the stream, giving the flowing water the appearance of ink for some time afterwards, although the actual pollution may not have been recent. As a preliminary treatment, good precipitation in tanks is indicated, and it is frequently necessary not to rely solely upon the natural precipitation caused by the mixed wastes, but to add additional precipitants, such as lime and sulphate of alumina.

* Iron and steel tanks cannot be employed for use in tanneries, since the skins would be damaged by their use.

Screens are advisable when the tank liquor is discharged into the sewers.

Tillmans mention that tannery liquors when run direct to drains frequently cause trouble when they contain sodium sulphide, and come into contact with acid effluents, like those from breweries, the sulphuretted hydrogen which result causing great annoyance in the streets. He further mentions that arsenic and other poisonous substances must be removed before any biological purification is taken in hand.

Parts per 100,000.

Nature of Sample.	Total Solids in Suspension. (Dried at 100° C.)	Total Solids in Solution. (Dried at 100° C.)	Ammoniacal Nitrogen.	Oxygen absorbed from $\frac{N}{80}$ Permanganate in 4 hrs. at 26·7° C.	Total Hardness (as $CaCO_3$).
Hour average mixed refuse ...	532	988	15·9	242·5	562
Do. do.	110	555	13	4·06	42
Do. do. ...	131	214	7	3·8	69

Now, as regards the action of arsenic upon nitrification at filters, it will be of interest to turn to some careful experiments which were made by the Massachusetts State Board of Health.* These experiments were conducted with tannery liquors in order to ascertain how much arsenic might be present in a sewage without seriously interfering with its purification by filtration, and also to see whether the proportion of arsenic ordinarily present in tannery wastes would prevent the starting of nitrification in a new filter. Two sand filters, 3 ft. 6 in. deep, were used, and settled sewage was applied at a rate of 100,000 gallons per acre daily, arsenic being added to one of the filters in the proportion of ·15 part per 100,000.

The filter receiving arsenic took four weeks to produce nitrates, while the filter which did not receive arsenic took seven weeks. Further experiments were carried out with two new filters, arsenic being added to one of them in the proportion of 2·5 parts per 100,000. The results were as follows:—

	Settled Sewage.	Settled Sewage plus Arsenic.
	Nitrate in parts per 100,000.	
After two weeks ...	·23	·1
,, three ,,	·72	1·0
,, four ,,	Nitrification equal	active nitrification.

The dose of arsenic was gradually increased to as much as 400 parts per 100,000, without any decrease in nitrification occurring. On increasing the dose to 500 parts of arsenic per 100,000, however, nitrification was effectually checked, and could not be again re-established. The arsenic was applied as As_2O_3 dissolved in sodium carbonate, and made nearly neutral. From the foregoing it would appear to be exceedingly improbable that the quantity of arsenic found in ordinary tannery wastes would exert any inhibitory action upon biological filtration.

Considering supplementary treatment, there are, so far as the writer is aware, no tannery waste liquor purification plants which are giving what might be termed satisfactory results, and this could hardly be anticipated, having regard to the inadequacy of many of the existing plants, and the carelessness with which they are worked. There is no doubt whatever that tannery wastes can be purified by biological treatment, either upon land or upon filters, but a large area of either (1) suitable land or (2) filters would be needed. Contact beds could be employed, but triple contact would certainly be necessary, and percolating filters would generally be preferable.

Wherever practicable, dilution of the wastes with water *after* tank treatment, and before further treatment upon filters or land, would be beneficial. In any case it would probably be impracticable, at any reasonable outlay, to produce an effluent of the same degree of purity as could be obtained from a sewage, and a tannery effluent might be regarded as sufficiently purified if it did not contain, say, more than 4 to 5 parts of suspended matter per 100,000, while not taking up more than a similar amount of dissolved oxygen in five days. Typical such results, however, the purification works would not only require careful

* Fourteenth Annual Report, pp. 359-361.

... but extended until arrangements ... [illegible] ... Given ... [illegible] ... treatment of ... 20 to 25 ... [illegible] ... [illegible] ... [illegible]

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 57 Moorgate-street, E.C., Solicitor of the Supreme Court.

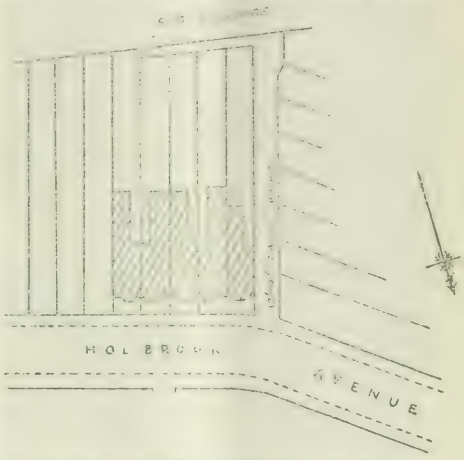
The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

ALLEGED NUISANCE: COMPLAINT DISMISSED: CLAIM FOR DAMAGES: PUBLIC HEALTH ACT, 1875, SECS. 91-96. An unusual point in connection with proceedings to abate an alleged nuisance was decided in *Bailey v. Rodgers* (the Law Reports, Division Court of Appeal). The defendant Bailey (who was the sanitary inspector of the council), having made an inspection of a house at Romford in the occupation of the plaintiff, served a notice on him, under sec. 94 of the Public Health Act, 1875, requiring him to abate an alleged nuisance on the premises. The notice not being complied with, Bailey, purporting to act upon the instructions of the council, preferred a complaint against the plaintiff before the magistrates under sec. 95 of the Act. The magistrates, however, dismissed the complaint, and allowed the plaintiff £5 5s. costs. The plaintiff then brought this action, claiming damages for malicious prosecution. The council, in their defence, denied (1) that they had not reasonable and probable cause for preferring the complaint, and (2) that they had acted maliciously. The case was tried before Mr. Justice Horridge and a jury. The jury answered the questions left to them as to reasonable and probable cause and want of *bonâ fides* in favour of the plaintiff, and assessed the damages at £250 against the council only. Mr. Justice Horridge held that the complaint under sec. 95 was a proceeding involving damage to the plaintiff's fair fame sufficient to support the action, if the complaint had been preferred maliciously and without reasonable and proper cause, and he gave judgment for £250 against both defendants. The Court of Appeal reversed this decision, and gave judgment for the defendants. Lord Justice Buckley said that an action of malicious prosecution would not lie unless the plaintiff could show that he had suffered one of three sorts of special damage—viz., (1) damage to his fame, as if the matter whereof he was accused was scandalous; (2) damage to his person; or (3) damage to his property. There was no question here as to damage to property, nor was there a danger of imprisonment; but the plaintiff, to succeed under the first head, must show that damage to his fair fame was the natural and necessary consequence of the proceedings he complained of. The complaint was, in a sense, a criminal proceeding, but the imputation conveyed by it did not necessarily attack the fair fame of the person against whom it was made. It might well be that the occupier of the premises was not in any way responsible for the existence of the nuisance. For these reasons he thought the judgment of Mr. Justice Horridge was wrong, and that the action was not maintainable; also that the findings of the jury were against the weight of evidence and inconsistent with another, and that the damages were excessive.

QUERIES AND REPLIES.

In order to avoid confusion, queriists are requested to use distinctive words as nom de plume. The letter X, combinations such as XYZ, the words such as "engineer" and "surveyor" should not be used.

BY-LAWS: SECONDARY MEANS OF ACCESS.—"Access" writes: Plans have been submitted to [illegible] By-law Nos. 7 and 10 in force in the district call for a secondary [illegible] the removal of house refuse and other matters. (Copy of By-laws 7 and 10 forwarded.) It has been the custom to allow a passage of about 3 ft. between the houses to serve from two to four houses as the secondary means of access. The plans now deposited [illegible] to serve the five houses. This plan has been disapproved on the grounds that it does not comply with By-law No. 7. The owner contends that the council has no right to disapprove the plan upon these grounds, neither has the council the right to say what width the secondary means of access shall be, nor as to the number of houses it shall serve, inasmuch as a passage as shown does not constitute a new street. The word street, as defined by the Public Health Act, 1875, includes footway, square, court, alley, or passage, whether a thoroughfare or [illegible]. This being so, [illegible] A passage placed between



[illegible] more houses (four in all)—does this constitute a new street, and, if so, has the council right to allow the passage to be only 3ft. wide; (c) a passage placed at the rear of the houses, as shown on plan—does this constitute a new street?

[TEXT [illegible] BY-LAWS.]

(7) Every person who shall lay out a new street which shall not be intended to form the principal approach or means of access to any building, but shall be intended for use solely as a separate means of access to any premises for the purpose of removing therefrom the contents of the receptacle of any privy, or of any ashpit, or of any cesspool, without carrying such contents through any dwelling-house or public building, or any building in which any person may be or may be intended to be employed in any manufacture, trade, or business, shall so lay out such street that the width thereof shall be 12 ft. at the least.

[illegible] which shall be intended for use as the principal approach to any building, shall provide in connection with such street and communicating therewith, or with some other street, a secondary means of access, where necessary for the purpose of the removal of house refuse and other matters.

[illegible] statutory defin[illegible] new street." (b) The same answer will apply to the first part of the query. The council cannot legally approve the [illegible] By-law.

COVERED STREAM.—"Acme" writes: The dotted line on the accompanying sketch shows the course and direction of a covered stream under streets and property before emptying into the river. The street A was sewered by the local authority thirty years ago, and at the same time surface-water gullies were fixed in the street and connected with the stream as shown, in order to avoid the surface water passing into the foul sewer. Does this act of the local authority constitute the stream for the length of this property a sewer vesting in the local authority? At the

The Surveyor
And Municipal and County Engineer.

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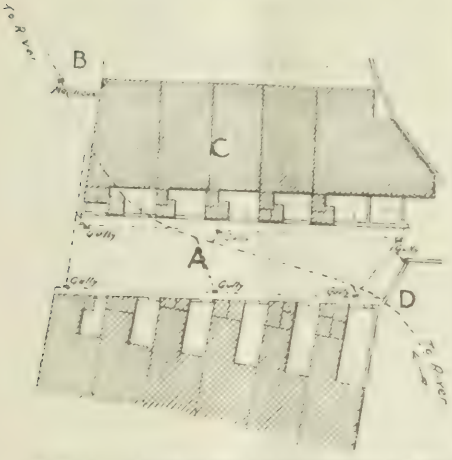
point B, and at a date previous to the street being paved a water main was laid in the street by C for the purpose of taking water to his works, which abut on the roadway street. At the present time the stream from the weir for the full length of the property to



the point D is blocked with silt and rubbish, and this causes the water in times of heavy rain to back up the surface-water gullies and flood the street. What is the position of the local authority in the matter? Can they or the property owners affected call upon C to take up the weir, and so remove the obstructions to the free flow of the water after so long a period? Or could C be proceeded against for a nuisance? Or does it devolve upon the local authority to cleanse the stream?

"In my opinion it is doubtful whether the stream is a "sewer" vested in the local authority. A conduit for surface water *may* be a sewer per Lord Justice A. L. Smith in *Eyre and v. Hollins Land and Building Company* 1893, 2 Q.B., at p. 144]). But I can find no instance in which a natural stream, *not* polluted by sewage, was held to be a "sewer," and in every case in which a natural stream has been held to be a sewer (so far as I can find) the ground of the decision was that the stream had been used for conveying sewage. See *Falconer v. South Shields Corpora-*

[illegible] prescriptive right to obstruct the stream as against other [illegible] to assume a public character. The [illegible] a public nuisance and [illegible] action to the [illegible]

[illegible] carried out, and these are some £200 above the surveyor's estimate. The surveyor is asked to carry out the work, and has to put on many extra hands, and has to put in much overtime. The work is eventually carried out for £50 below his estimate, and £160 below the lowest tender. Would not the surveyor in this case be doing the work of a contractor? Would he not reasonably be entitled to at least half a contract [illegible] A surveyor taking a post and undertaking to give his whole services. Does not this refer to services of a surveyor and conducting of duties connected with [illegible] staff of men? Could he not reasonably expect extra if called upon to carry out any extensive works? (3) A surveyor appointed for twelve months is not reappointed, but is still acting at the end of three years. Is he still bound by the terms of the first appointment? (4) A surveyor also appointed as [illegible] engineering work in connection with waterworks. Could he [illegible]

[illegible] of a surveyor's duties. It would appear, however, that the only way in which extra remuneration can legally be paid [illegible] salary for a specified period, commencing not sooner than [illegible] p. 451. (2) This would depend upon the terms of the engagement and the nature of the works. (3) Yes, in the [illegible] a claim would seem reasonable.

"THE SURVEYOR" SPECIAL ISSUE.

FEATURES OF NEXT WEEK'S NUMBER.

In the Special Annual Issue of THE SURVEYOR to be published next week the customary comprehensive list of the works projected for 1915 by the various local authorities will, as usual, be preceded by a series of articles contributed by specialists reviewing the progress which has taken place during the past year in connection with road work, sewerage and sewage disposal, water supply, refuse disposal, street lighting, electricity supply, housing and town planning, bridge construction, tramways, street lighting, and the provision of public buildings.

The legal precedents and legislation of 1914 in relation to municipal engineering will be reviewed by the law editor, Mr. J. B. Reignier Conder, while another valuable feature of the issue will be a survey of the year's literature of municipal engineering.

A special article on "Groynes and Sea Walls" will be contributed by Mr. A. T. Walmisley, M.INST.C.E.; the new Johannesburg town hall and municipal buildings will be described and illustrated; in addition to which there will be the customary reports of municipal works in progress and projected, law notes, local government inquiries, assistants' and students' section, and the fullest information relating to vacant appointments, municipal contracts and competitions.

To non-subscribers the price of the Special Issue will be 1s., but subscribers will receive their copies without extra charge.

Rural Surveyor Anxious to Enlist.—The surveyor to the Stafford Rural District Council, Mr. Frank Ideans, being anxious to join the colours, submitted the matter to the Highways Committee, who recommended that his position be kept open, and that he be allowed £100 per annum. When the subject was discussed at the council meeting, however, it was pointed out that there might eventually be a modification of his position owing to the extension of the Stafford borough boundaries, and upon this plea the committee's recommendation was referred back.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

451. Hydraulics. Sketch a practical form of hydraulic ram for raising automatically to a considerable height a portion of any volume of water derived from a lesser height, and explain the points upon which satisfactory working depends.

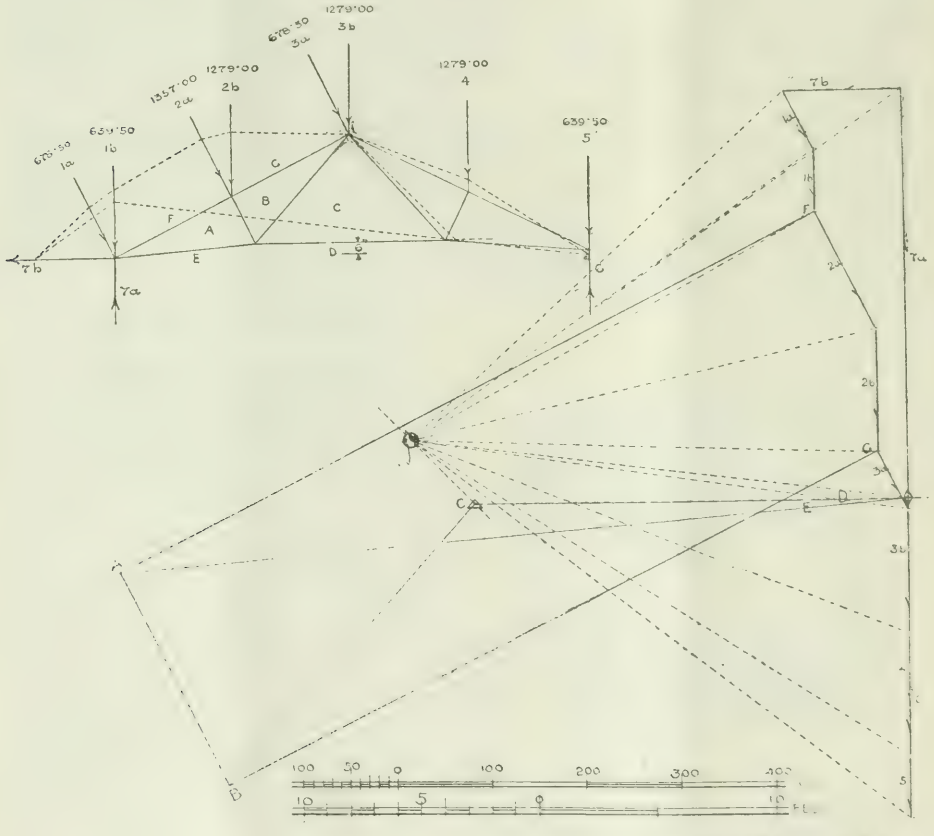
452. Wells. What are (1) A deep well, (2) a shallow well, (3) an artesian well, and (4) an Abyssinian well? Give definitions. (G. C., *Wigston Magna.*)

453. Building Construction. Draw a section showing the construction of a flat asphalted roof, carried on timber joists 10 in. by 2½ in., roofed below the walls to form of 14 in. brickwork, surmounted by a 9-in. parapet, 2′ 0″ high, coped with stones, the section to run across the joists and through the parapet walls. ("Ajax.")

454. Foundations.—What should be the composition of concrete for the foundations of a factory chimney shaft? Would lime concrete be suitable? (Ajax.)

NOTES.

449. Roof Truss. The accompanying diagrams show the stresses in the members of the roof truss illustrated in the "Assistants' and Students' Section" last week, when subjected to the loads and wind pressure indicated.



A I	+	8,325 lb.	2½ in.	×	2 in.	×	1. I
B G	+	7,600 ,,	,,		,,		,,
A B	+	2,525 ,,	2 in.	×	1 in.	×	in. L
A E	−	8,250 ,,			3 in.	×	in.
B C	−	3,925 ,,			2 in.	×	in.
C D	−	4,515 ,,			,,		,,

		lb.	lb.
Dead loading		1000 × 11·50 × 2·50	28,750
Purlins, 8 in. × 1 in.		10 × 666 × 8·33 × 3·00 × 2	13,325
Slate battens		1000 × 11·50 × 2·00	23,000
Slates		1000 × 11·50 × 2·00	1,035,000
Snow		1000 × 11·50 × 4·00	46,000
			2,146,075
			2
			4,292,150
		Weight of truss	58,850
			5,116,000

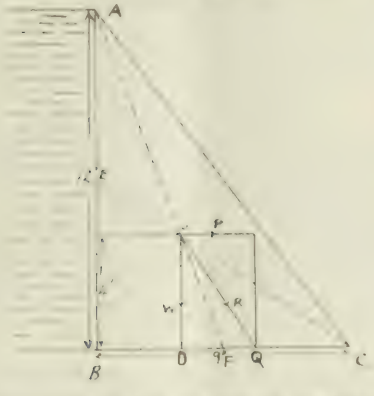
Wind say 30 lb. × 30 = 2,700 lb. normal 1000 × 11·50 × 2·700 = 2,754,000 lb.

2,700 coefficient for $\frac{\text{Span}}{\text{Rise}}$ $\frac{45·00}{4·50}$

STEEL ROOF TRUSS 10-FT. CENTRES

REPLIES TO QUESTIONS.

450. Masonry Dam.—The inner face of a masonry dam is a plane vertical surface 12 ft. in height. The section of the dam is a right-angled triangle 9 ft. wide at the base, and the weight of the masonry is 125 lb. per cubic foot. When the reservoir is filled to the upper edge of the dam, find the point at which the resultant pressure intersects the base. (A.M.I.C.E.)



Consider the dam to be 1 ft. in length, and therefore the volume of the dam $= \frac{12 \times 9}{2}$ cu. ft.

Weight of dam $= 54 \times 125 = 6{,}750$ lb.

The resultant pressure intersects the base at the point of intersection of the vertical centre of gravity of the section of the dam ABC.

Let the line of action of this weight meet the base at D.

The pressure of the water = WAH.

where W = Weight of one cubic foot of water
= 62·3 lb.
A = Area of surface of dam
= 12 sq. ft.
H = Head of water at centroid of surface.
= 6 ft.

Pressure of water $= 62{\cdot}3 \times 12 \times 6$
$= 4485{\cdot}6$ lb.

This pressure acts horizontally at a distance $\frac{1}{3}$AB = 4 ft. from the base of the dam;

∴ its line of action passes through O.

W = 6750 lb. is represented to a suitable scale by OD = 4 ft.

P = 4485·6 lb. is represented to the same scale by $\frac{4 \times 4485{\cdot}6}{6750} = 2{\cdot}66$ ft.

On completing the parallelogram formed by the two forces W and P, we find that their resultant meets the base at Q.

But DQ = P = 2·66 ft.

The distance of Q from B = BD + 2·66 ft.

But BD = $\frac{1}{3}$BC = 3 ft.

∴ Distance of Q from B = 3 + 2·66
= 5·66 ft.

or from C = 3·44 ft.

(N. W. K., *Barry St. Edmund's*.)

Military Traffic in Norfolk.—The county surveyor of Norfolk, Mr. T. H. B. Heslop, has reported to the Western Highways Committee that considerable damage had been done to the main roads by military traffic. Under the traffic of troops and guns, footpaths had been absolutely destroyed. The flint roads had also been badly damaged by the passage of guns and horses. The damage must be repaired. He was under the impression that the cost of repairs must fall upon the county, but he had learned from the Road Board that any reasonable damage would be made good by the authorities. He proposed to have the work of repairing carried out, and to send in the bill to the Road Board. He had laid the facts before the board, and would prefer to send in a bill for the cost of repairs rather than an estimate.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Colne T.C. (January 14th. Mr. F. H. Tulloch). [illegible] gasworks [illegible] and [illegible] [illegible] The total amount [illegible] is proposed to be raised in 1914 from the [illegible] of Dudley at [illegible] 1 × 3/4. There were no [illegible]

Colwyn Bay U.D.C. (January 19th. Mr. A. G. Darby).—£11,000 for sewerage works. Mr. Isaac Amphlett, engineer, stated that it was intended to [illegible] from Mochdre to the [illegible] sewage farm. The contract was [illegible] different sections as soon as [illegible] but [illegible] Some parts of the [illegible] to be opened up [illegible] and the other part would be [illegible] by means of a temporary [illegible] which would [illegible] the sewage [illegible] the [illegible] [illegible] [illegible]

plans for the erection of a cliff tramway, giving easier access to the beach.

APPLICATIONS FOR LOANS.

Barnsley T.C.—£4,500 for the purpose of the electricity undertaking.

Billericay R.D.C. £1,400 for laying water mains.

Bournemouth T.C.—£4,630 for works of street improvement.

Coole U.D.C. £13,000 for gasworks extensions.

Hindley U.D.C.—£12,200 for private street works.

Holmfirth U.D.C.—£7,500 for electricity works.

Ince U.D.C.—£13,500 for a new school, and £600 for tar-macadamising.

Keith T.C.—£8,000 for a new reservoir.

Kenmare R.D.C.—£4,000 for a water supply.

Maldens and Coombe U.D.C.—£850 for surface-water sewerage.

Normanton U.D.C.—£4,000 for the extension of the sewage disposal works.

Penistone U.D.C.—£1,000 for water pumping plant.

Rowley Regis U.D.C.—£1,482 for a technical school.

Salford T.C.—£18,252 for the provision of a transformer sub-station, £25,000 for high-tension mains, and £6,533 for extensions to the Pendleton car depot.

Sculcoates R.D.C.—£2,500 for a reservoir.

Shepshed U.D.C.—£1,450 for the purchase of a site for a housing scheme.

Taunton T.C.—£3,450 for the provision of public baths.

Truro T.C.—£10,000 for the electricity undertaking.

Yeovil T.C.—£1,155 for the construction of an overflow sewer.

LOANS SANCTIONED.

Barnsley T.C.—£400 for road widening.

Broadstairs U.D.C.—£2,650 for the provision of a depot.

Chelmsford T.C.—£620 for the provision of slipper baths.

Criccieth U.D.C.—£3,294 for workmen's houses.

Harwich T.C.—£2,114 for road improvement.

Hungerford R.D.C.—£1,500 for workmen's houses.

Poole T.C.—£586 for street improvement, and £336 for surface-water drainage.

Radcliffe U.D.C.—£4,500 towards the cost of a joint sewerage scheme.

Stafford T.C.—£13,700 for a new gasholder, and £20,000 for vertical retorts.

Stanley U.D.C.—£3,000 for laying out a public park.

Tiverton T.C.—£150 for works of water supply.

Woking U.D.C.—£2,081 for making up certain roads.

FORTHCOMING INQUIRIES.

JANUARY. £

26.—**Arlecdon.** For the purposes of the gas undertaking (Mr. W. M. Cross) ... 3,500

26.—**Chesterfield.** For a sanitary conversion scheme (Mr. W. O. E. Meade-King) ... 7,020

26.—**Harpenden.** For private street improvement (Mr. M. K. North) 535

26.—**Manchester.** For private street improvement (Mr. F. H. Tulloch) 14,579

26. **Windermere.** For street and park improvement (Mr. R. H. Bicknell) ... 1,800

27.—**Barrow.** For the purposes of public slaughter-houses (Mr. W. M. Cross) ... 1,700

27.—**Chadderton.** For road improvement and laying out a recreation ground (Mr. F. H. Tulloch) ... 2,011

27.—**Hylton.** For the provision of a burial ground (Mr. R. H. Bicknell) 820

27.—**Southend.** For surface-water drainage (Mr. M. K. North) 4,860

28.—**Bingley.** For main road widening (Mr. R. H. Bicknell) 267

28.—**Hasel Grove.** For street and depot purposes (Mr. F. H. Tulloch) 400

28.—**Ilkley.** For the extension of the King's Hall (Mr. W. O. E. Meade-King) ... 2,800

28.—**Wallasey.** For the provision of a ferry steamboat (Mr. W. M. Cross) ... ... £ 27,920

29.—**Hemsworth.** For cemetery extension (Mr. F. H. Tulloch) 1,400

29.—**Pickering.** For works of water supply (Mr. W. O. E. Meade-King) 700

CORRESPONDENCE.

Ἐκ ἀνὴρ ὃν πάνθ' ὁρᾷ
(One man who sees all things.)
EURIPIDES

PROFESSIONAL MEN AND THE WAR.

To the Editor of THE SURVEYOR.

SIR,—I should be glad if you would again grant me space in your journal to discuss recruiting for the Army.

The Architects' War Service Bureau is in a position to advise professional and business men and men of skilled trades as to the branch of the Forces in which they can best serve the Government and for which they are personally most suited.

More particularly we are recruiting for the Royal Engineers and Sanitary Companies. But we are also at present making a special effort to recruit a gun section for the R.F.A. Howitzer Reserve, to be composed of professional and business men, who will serve together.

Lastly, since the War Office have officially recognised the Volunteer Training Corps now existing in London, no man, whatever his age or circumstances, has any excuse for not being a member of a military organisation. Those who can join the Regular Forces should do so at once; those who cannot, should join the Architects' Volunteer Training Corps, which is recognised by the Architects' War Committee, the Surveyors' Institution, the Auctioneers' and Estate Agents' Institution, the Junior Art Workers' Guild, and the London Master Builders' Association. By doing so they can materially help the recruiting authorities to distinguish between the "willing" and "unwilling" members of the community.

All recruits should apply direct to 18 Tufton-street, Westminster, S.W.—Yours faithfully,

ALAN POTTER.
Hon. Recruiter, A.V.T.C.

January 19, 1915.

THE BALTIC TIMBER TRADE.

To the Editor of THE SURVEYOR.

SIR,—As the originator of the query in your issue of December 25th "whether it is a fact that the Baltic timber trade is mainly controlled by Germans," I note (not without satisfaction) that such a view is, in your issue of January 8th, stigmatised by a contributor, who claims to know, as "absolute nonsense."

Strong as this assertion is, greater conviction would be felt by reliable facts being adduced to controvert the above-mentioned view, which I may say is based upon first-hand information obtained during a recent visit to Sweden, from a leading Berlin commercial financier. It is but right to say that he expressly excluded the Bergevik Company, much of the capital of which is, I believe, held in this country.

The undoubted fact that the Germans have very large financial and commercial interests in Sweden, coupled with the significant circumstance that a large number of timber-importing firms bear German names, seemed to lend colour in confirmation of my informant's statement.—Yours, &c.,

W. H. S.

January 19, 1915.

Welsh Tramway and Sewerage Bills.—The Aberdare Urban District Council (Tramways) Bill, and the Monmouthshire Eastern Valleys Joint Sewerage Bill on Tuesday passed the examiners, and were sent for first reading when Parliament meets.

Proposal to Erect Three Thames Bridges.—At the meeting recently of the Thames Conservancy Board, provisional acquiescence was expressed with the plans for three new bridges across the Thames. One of these would be constructed across the river between Goring and Streatley, and the other two, it is suggested, should be erected between Reading and Caversham.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this heading as complete and up-to-date as possible.*

[illegible] Borough Surveyor, Rural Surveyor, Surveyor and Engineer, Engineer and Surveyor, Engineer, Engineer and Manager, Engineer and Surveyor, Engineer and Surveyor, Engineer and Surveyor

with barely sufficient team labour to perform the ordinary removal of the house refuse of the town. Of course, this put an end to the work of cleansing which the department was carrying out in the camp. Notwithstanding this, however, the divisional barrack officer called upon him to inquire if it were possible for the council to undertake the scavenging work of the camp permanently. It also prevented his executing the street cleansing that was so urgent in the recent foul weather. The council agreed to give the Highways Committee power to purchase six horses.

ROADS AND MATERIALS.

Berwickshire C.C.—A sub-committee appointed to tar-spray the streets at Earlston has reported that the work had been carried out, and the result was quite satisfactory so long as the weather was dry. There was also a considerable diminution in dust. Since the setting in of the wet weather the appearance is not so good. It was referred to the sub-committee to watch the behaviour of the surface during the winter and to report to the next meeting of the West District Committee. The total cost was a little over £140, half of which is to be refunded by the Road Board.

Bournemouth T.C.—The council have accepted the tender of Messrs. William Griffiths & Company, Limited, at £6,336, for laying wood-block paving in Holdenhurst-road from Lytton-road to Richmond Park-road, also the tender of Mr. J. Francis at £649 for the making up of the Southbourne Overcliff Drive-road.

Camberwell B.C.—The council have passed an estimate of £2,651 for repairs to the Crystal Palace parade, and have asked the Road Board to make a grant in aid of the work.

Chiswick U.D.C.—Arrangements have been made to deal with the wood paving of Bath-road at a price which is 1s. a yard above the original tender, but which will be a saving compared with what would have to be paid in mere repairs if the present arrangement was not carried out.

Clacton U.D.C.—The council have approved the report of the surveyor, Mr. D. J. Bowe, for additional work required to complete the West Cliff improvement. The estimated cost is £450.

Deptford B.C.—The council have approved a report prepared by the borough accountant, outlining a scheme for equating the expenditure on highway purposes over the next six years, by which the council would be able to defray the cost of repaving New Cross-road. It appeared that the income of the fund would be a uniform charge on the rate of £16,000 per annum, out of which would be paid the ordinary highway maintenance expenses, and the capital charges in respect of permanent paving works defrayed out of loan.

Derby C.C.—The council have approved the recommendation of the Highways Committee for the improvement of the bend in the main road between Chapel-en-le-Frith and Hayfield, at an estimated cost of £400, apart from the purchase of the land. Many other proposals for widenings, which the Highways Committee have considered at the instance of the Road Board, are in abeyance.

Doncaster T.C.—Attention was called recently to a recommendation that as the present street crossings wear out they should be taken up and the road made good without relaying the crossings, and a member asked if it meant the abolition of crossings. Councillor Wightman replied that it meant that the streets would be all crossings instead of crossings here and there, and it was intended to make the roads so that there would be no need for crossings.

Esher and the Dittons U.D.C.—The surveyor, Mr. H. C. Fread, has been authorised to arrange for the supply of rail-borne granite sufficient to keep up necessary patching-work, the contractors having intimated that, owing to shipping difficulties, they could not deliver sea-borne granite.

Exeter T.C.—The city surveyor, Mr. T. Moulding, has received instructions to carry out the street widening at the junction of Pinhoe-road and Polsloe-road. The cost of the work, including the purchase price of the land, and arbitration proceedings, is estimated at £768.

Hackney B.C.—The council are recommended to widen part of Homerton-road, at an estimated cost of £1,900.

Hammersmith B.C.—It has been agreed to undertake the diversion of Old Oak-road and the widening of Old Oak Common-lane, at an estimated cost of £1,915, towards which the Ecclesiastical Commissioners are expected to contribute £400, and the London County Council £1,000.

Manchester T.C.—The Parks Committee are steadily adding to the number of districts and thoroughfares in which they are planting trees and generally improving the scanty stock of foliage, says the *Manchester Guardian*. In all nearly 4,500 trees have been planted in the outlying districts, particularly on the south side of the city, and so successful have been the results that the inner and eastern parts of Manchester are now the scene of experiments. Tree-cultivation is being attempted in Clopton-street, Hulme, and Grey Mare-lane, Openshaw, and probably other parts of Hulme and Moss Side and Higher Openshaw will follow.

Manorhamilton (Ireland) R.D.C.—The council have passed proposals for four additional new roads, at a total cost of £1,830. The works are approved subject to assistance from the Congested Districts Board and Estates Commissioners.

Margate T.C.—It is proposed to carry out road widenings and bridge construction, at an estimated cost of £12,500, and application is to be made to the Road Board for a grant.

Marlborough T.C.—Upon the road estimates coming up for consideration it was agreed that an additional £333 be passed for the purpose of providing granite, instead of flint, on the main road from London to Bristol.

Norfolk C.C.—Reference was made at the recent meeting of the council to the difficulty of obtaining supplies of granite. In moving the adoption of the report of the Eastern Highways Committee, Mr. R. J. Colman stated that it was of the utmost importance that such supplies should be kept up as well as the council were able to obtain them. Unfortunately, owing to the demand for granite, and the consequent rise in cost, it was difficult to get consignments. The council accepted contracts last year for certain supplies, but the council could not under present circumstances obtain seaborne granite from Northumberland, and they were having to buy what they required from two other sources—namely, Guernsey and Leicester. Both supplies had risen, but at increased price.

Norwich T.C.—The council have accepted the offer of the Road Board to advance by way of loan, free of interest, and repayable by five annual instalments, the sum of £2,500, the cost in connection with the improvement of additional areas of the surface of Newmarket-road, and the town clerk has been authorised to apply to the Local Government Board for sanction to the borrowing of the money.

Romford U.D.C.—The Local Government Board, having intimated their willingness to grant sanctions for loans to carry out the proposed improvement in the main London to Colchester road, the surveyor, Mr. H. T. Ridge, has been instructed to proceed with the preparation of the specification for the work.

Rotherham T.C.—The Highways Committee recommend that the borough engineer arrange to repair the portion of Wortley-road from the Sportsman Inn to Bray Plantation at an estimated cost of £882, to be repaid out of revenue, and that the tender of Mr. H. Roberts, of Gainsborough, of £1,280 for private street works in Ridge-road be accepted.

South Stoneham R.D.C.—The surveyor, Mr. F. Heather, has submitted a report on the repair of the local roads, involving an outlay of £650. The military authorities desired the work to be started at once. The matter would have to be referred to the Road Board, and the council would be reimbursed, save as might be otherwise agreed between the local authority and the board. It was agreed that the work should be proceeded with, and thanks were accorded to the surveyor for the way he had carried the matter through.

Surrey C.C.—On the recommendation of the county surveyor, it has been decided to expend £75 on the purchase of a motor cycle with side-car attachment for the use of the assistant (who had to take with him a chain-man and the necessary instruments for measuring purposes) employed in making a survey of the dangerous curves and corners in the county. The Road Board have undertaken to pay such official's travelling expenses.

Warrington T.C.—The Health Committee have presented a report drawing the attention of the Paving and Sewering Committee to the need for paving in Oldham-road, Slater-street, Cairo-street, Peter-street and neighbouring streets in Latchford.

West Riding C.C. Included in recent estimates of the Highways Committee was an item of £92,336 for works to provide employment in distress areas. It was explained that at present there were little distress in the Riding, the proposal being put forward to safeguard the committee in the event of a period of exceptional distress arising.

Wombwell U.D.C. It has been decided to carry out works of street improvement at an estimated cost of £7,908.

SEWERAGE AND SEWAGE DISPOSAL.

Chelmsford T.C.—The accounts for the joint sewage farm presented recently showed that the expenditure of the year had exceeded receipts by £139. The Councillor Grey said, was not quite so satisfactory as in the previous two years, when a profit was shown, but the bulk of the deficit was due to work which might be considered as capital expenditure in making earth banks and similar works. They had enclosed 6 acres, and the committee considered it a very good job done cheaply. Taking the profits of the previous two years, they would find that it meant that the disposal of sewage had not cost the borough a penny for three years except in the matter of repayment of loans, &c.

Doncaster R.D.C. Messrs. Balfour have been instructed to prepare plans and specifications for additional liquefying tanks and filters at the Cusston and Skellow sewage outfall works.

Doncaster T.C.—At the meeting held recently a discussion took place on the proposal of the council to prepare a new sewage scheme for the extended borough on competitive terms, and to ask the advice of the Institution of Civil Engineers as to the conditions consistent with their institution. The proposal was carried in committee as an amendment by 14 to 13, and Alderman Carr, in moving that the motion be not confirmed, urged that the borough surveyor had already too much work to do, and said a committee had been appointed to consider how to afford relief to certain officers upon whom the extended borough had thrown extra pressure. The motion to reject the recommendation was defeated, but eventually the matter was referred back.

Norwich T.C. The balance-sheet of the Whitlingham Hall sewage farm for the year 1914 shows a profit of £65. The result would have been more satisfactory, but for the fact that five bullocks, valued at £140, had died.

Teddington U.D.C. The Sanitary Committee on Monday recommended the acceptance, at £22,298, of the tender of Messrs. J. J. Mann & Co. for the sludge filters for the sewage disposal works. It was agreed, however, to refer the three lowest tenders to Mr. Fairley, the engineer to the scheme, for report, as it was possible he might suggest modifications which would effect a saving of £3,500. It was further agreed to pay Mr. Fairley a fee of £100 if his suggestions were not adopted, or £250 if they were.

WATER, GAS, AND ELECTRICITY.

Ballinrobe U.D.C. The council have prepared a scheme for an improved water supply to the town estimated to cost £5,000.

Bethnal Green B.C.—The Electricity Committee have submitted an estimate of £15,944 for the supplying and laying of cables and execution of road work in connection with the new electricity undertaking. The council do not intend to generate their own electricity, but will obtain the supply they require from the Stepney Borough Council. In connection with the contract for cables and accessories, the Electricity Committee propose to stipulate that these shall be manufactured by British firms.

Bourne U.D.C.—The council have obtained a loan for the purchase of the gas-works—viz., £275 for ten years, £600 for sixty years, and £13,355 for thirty years—all at 4½ per cent. to be repaid in equal half-yearly instalments of principal and interest.

Cardiff T.C.—The Waterworks Committee have resolved to send a circular letter to architects, builders and contractors, stating that on and after March 1st next all water fittings and appliances must be submitted to the corporation for testing, excepting those bearing the registered trade mark. This action is taken, it is said, in the interests of [illegible] of the fittings used within the area of the corporation. The testing fees will vary from 1d. for taps to 4d. for cisterns.

Exeter T.C.—The Water Committee have decided, on the report of the city engineer, Mr. T. Moulding, to recommend the duplication of the machinery extension of the filtering beds at Pynes waterworks. They say that the matter will admit of no further delay. The Earl of Iddesleigh has offered to present to the council the land required for the two new filter beds, subject to the council undertaking certain slight services, and the thanks of the committee have been presented to his lordship for his liberality. The committee recommend that application should be made to the Local Government Board to sanction the borrowing of £8,824 for the duplication of the machinery and other extensions of the waterworks.

Teddington U.D.C.—The Sanitary Committee, in their report upon the electric lighting tenders, recommended that one 100 horse-power [illegible] be accepted, and that the tenders of Messrs. [illegible] Queen Victoria-street, Westminster, be accepted, the price being £545 or £556, according to the type of oil engine. As to this point, the matter was left to the engineer, Mr. [illegible].

MISCELLANEOUS.

Hull T.C. It was stated at a meeting of the Water Committee last week that, under the agreement with the corporation, a water supply for Withernsea will be available by the end of June next. For the purpose of that supply to Withernsea, and the rural district between Withernsea and Hull, a water tower and reservoir will have to be constructed. The committee sanctioned the purchase of a site at the rate of 70 per [illegible].

Paddington B.C. In order to provide work for the unemployed, the council have formulated a scheme for rearranging disordered memorial stones and levelling disturbed ground in the Paddington Cemetery. The work will cost £324.

PERSONAL.

Mr. F. G. McHugh, Municipal Buildings, Norwich, has been elected a member of the Royal Sanitary Institute.

Mr. James G. Melvin, B.SC., of Maryhill, Glasgow, has been appointed assistant burgh surveyor of Helensburgh.

Mr. R. O. Roberts, of Langport, Somerset, has been appointed surveyor to the Pontypool Rural District Council at a salary of £100 a year.

Mr. H. H. Oakes, surveyor to the Ventnor Urban District Council, has been appointed clerk to the council *pro tem.* in the absence of Mr. W. Tozer on military service.

Mr. J. H. Lowndes, of Scunthorpe, has been appointed mechanical engineering assistant in the Norwich city engineer's department, at a commencing salary of £150 per annum.

Mr. Walter V. Anderson, the city engineer and surveyor of Winchester, had the honour of being presented to the King on the occasion of His Majesty's visit to that town last week.

Mr. B. Ball, municipal engineer's office, Singapore, who has been transferred from the class of associate-member to that of member of the Institution of Civil Engineers, is at present in England on leave.

Mr. Donald McColl, superintendent of the Glasgow Corporation cleansing department, was last week presented by his colleagues with a silver rose-bowl with flower vases upon his retirement after forty-six years' service.

Mr. G. L. Butterworth, who, as announced in our issue of last week, has been elected an associate-member of the Institution of Civil Engineers, is the engineer and surveyor to the Isle of Thanet Rural District Council.

Mr. H. A. Hosking, surveyor to St. Germans Rural District Council and Mr. W. Olver, surveyor to

Newton Abbot Urban District Council, have been appointed assistant county surveyors to the Cornwall County Council. The appointments are made in connection with the county taking over direct control of the roads in East Cornwall.

Mr. Jeremiah Wolstenholme, ASSOC.M.INST.C.E., ex-borough engineer and surveyor of Blackpool, died, we regret to state, last week, at the age of sixty-one. He was appointed to the Blackpool position in 1885, and resigned in 1900, and was responsible for many important municipal schemes, including the North Shore parade, the South Shore drainage, the electricity works and tramway depot.

Mr. A. E. Brookes, late county surveyor of Cornwall, who was recently appointed county surveyor of Durham, has been the recipient of a pleasing souvenir from the members of the Main Roads Committee of the Cornwall County Council. The chairman, Mr. A. Carbeck, at the meeting on the 13th inst., stated that the members contributed towards a gift to show their appreciation of the services rendered by Mr. Brookes, and how much they valued him and his loyalty to them. They had hoped to have Mr. Brookes with them that day, but as he was not he would send the gift—a case of cutlery—together with an expression of their feelings towards him.

FOR OTHER ADVERTISEMENTS
See End of Paper.

GOOLE URBAN DISTRICT COUNCIL.
SURVEYOR'S ASSISTANT.

Applications are invited for the appointment of Assistant in the Engineer and Surveyor's Department.

Applicants must be good draughtsmen, with a good knowledge of Surveying, Levelling, Building and Drainage Inspection, and the general work of a Surveyor's Office. Salary at the rate of £75 per annum.

Applications, in candidate's own handwriting, endorsed "Surveyor's Assistant," stating age and experience, accompanied by copies of not more than three recent testimonials, and giving the date on which the applicant can take up his duties, must be received by me not later than Monday, the 1st February, 1915.

J. H. CASTLE,
Engineer and Surveyor.

Council Offices,
Goole.
January 19, 1915. (2,285)

BOROUGH OF CHEPPING WYCOMBE.

The Corporation invites applications for the post of Temporary Clerk to fill the place of one on Military Service.

Preference will be given to those who have a knowledge of Municipal Accounts. Salary, 30s. per week.

Applications, stating age, experience, &c., accompanied by copies of three testimonials of recent date, must be delivered to my office by February 3, 1915.

Canvassing will be considered a disqualification.

T. J. RUSHBROOKE,
Borough Engineer and Surveyor.

25 Easton-street,
High Wycombe. (2,280)

CITY AND COUNTY OF THE CITY OF EXETER.
ROAD FOREMAN.

The Council of Exeter invite applications for appointment as Road Foreman, at a salary of £150 per annum.

A statement of the duties and Form of Application can be obtained at my Office.

Applications, on the official Form, must be received at my Office on or before Friday, the 5th February, 1915.

Canvassing will disqualify.

H. LLOYD PARRY,
(2,282) Town Clerk.

COUNTY BOROUGH OF DEWSBURY.

Wanted, in the Borough Engineer's Office, a Temporary Engineering Assistant. Must be a good Draughtsman. Commencing salary at the rate of £100 per annum. Any further information may be obtained by applying to the Borough Engineer, Town Hall, Dewsbury. Applications, in envelopes marked "Engineering Assistant," must be in the hands of the Borough Engineer not later than 4th February, 1915. (2,286)

LANGPORT RURAL DISTRICT COUNCIL.
SURVEYOR'S ASSISTANT.

The Council invite applications from qualifying Engineers and Surveyors for the appointment of a Surveyor's Assistant. Salary at the rate of £75 per annum, payable monthly.

The person appointed will act under the supervision of the Surveyor, and perform such duties as he may require.

Applications, in candidate's own handwriting, stating age and qualifications, and accompanied by copies of not more than three recent testimonials, to be sent to the undersigned not later than the first post of Monday, 25th instant.

(By order)
EDWD. Q. LOUCH,
Clerk to the Council.

Council Offices,
Langport, Somerset.
January 12, 1915. (2,281)

CITY AND COUNTY OF THE CITY OF EXETER.
CLERK OF WORKS.

The Council of Exeter invite applications for appointment as Clerk of Works, at a salary of £150 per annum.

A statement of the duties and Form of Application can be obtained at my Office.

Applications, on the official Form, must be received at my Office on or before Friday, the 5th February, 1915.

Canvassing will disqualify.

H. LLOYD PARRY,
(2,283) Town Clerk.

CITY AND COUNTY OF THE CITY OF EXETER.
CLEANSING SUPERINTENDENT.

The Council of Exeter invite applications for appointment as Cleansing Superintendent, at a salary of £120 per annum.

A statement of the duties and Form of Application can be obtained at my Office.

Applications, on the official Form, must be received at my Office on or before Friday, the 5th February, 1915.

Canvassing will disqualify.

H. LLOYD PARRY,
(2,284) Town Clerk.

URBAN DISTRICT OF PENGE.
TENDERS FOR SUPPLIES.

Notice is hereby given that after the expiration of 10 days from the date hereof the Urban District Council of Penge intend to enter into Contracts for the Supply of the following Goods and Materials; and that they are prepared to receive Tenders for the same, namely,—

Artificial Stone.
Brooms.
Disinfectants.
Drysaltery.
Flint, Sand, Gravel, and Ballast.
Tarred Granite.
Cement and Lime.
Granite Macadam and Chippings.
Winding, Regulating, &c., Clocks.

Forms of Tenders (which alone will be received), with full particulars of the various places of delivery, periods of Contracts, &c., may be obtained on application to the Surveyor, Town Hall, Anerley, S.E., on and after Tuesday, the 26th day of January, 1915.

Sealed Tenders, endorsed "Tender for ——," as the case may be, to be delivered to me, the undersigned, not later than 12 o'clock noon on Saturday, the 6th day of February, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

Dated this 21st day of January, 1915.

ARTHUR E. EVES,
Clerk to the Council.

Town Hall,
Anerley-road, Anerley, S.E. (2,287)

BUILDER'S MANAGER seeks situation. Good manager, estimating, quantities and draughtsman; life-long experience; good references.—S., 103 Belgrave-road, Birmingham. (2,287)

NEW COUNCIL SCHOOL AT TWICKENHAM.

At Twickenham recently the new Church [illegible] were formally declared open by Mr. W. A. Slade, J.P., the Chairman of the Education Committee, presided, and Mr. F. W. Pearce, the Chairman of the Council, in moving a vote of thanks to Mr. J. H. Bevan, the Chairman of the Education Committee, said that, as a general rule, in this district, they appointed a consulting architect, leaving their professional friend nothing but praise for the way he attended to the building and [illegible] to finish.

The new building has been designed to accommodate 420 boys on the first floor and 420 girls on the ground floor, and, together with the building for the infants erected in 1911 on the same site, will provide places for 1,250 children. The accommodation consists of separate assembly halls for boys and girls, each 30 ft. by 28 ft. 6 in., sixteen class-rooms, teachers' rooms, cloak-rooms and lavatories for boys and girls, and basement for heating apparatus and coal and coke stores.

Special attention has been given to the question of lighting and ventilation. The class-rooms are placed so as to receive direct and ample lighting on the south side, carried to the full height of the rooms, and are so planned that in every case the desks are lighted from the left-hand side of the scholars. In addition to the window ventilation, special inlet and outlet ventilators are provided in each class-room, arranged so as to secure adequate ventilation at different levels above the breathing line, and ventilators fitted with regulating valves are also provided near the external walls for the supply of warm fresh air during the winter months. The assembly halls, corridors and cloak rooms are also provided with special extract flues connected with ventilating turrets in the roof, and the cloak-rooms are fitted with wrought-iron lattice folding gates, which not only serve as a protection against theft, but also materially assist the ventilation. The school is heated throughout by an accelerated low-pressure hot-water system, and is lighted throughout by electric light, the whole of the wiring being placed in steel tubes.

The building is faced externally with Adderley Park best pressed red facing bricks up to the level of the window sills, and picked stock facings for the remainder of the height, and the window mullions are constructed in red brick, with artificial stone keys. Artificial stone has also been used for the window sills, the dressings to the entrance doorways and windows, and for the coping of the parapet walls. The roofs are covered with Welsh green slates. Internally the walls are finished with plastolith dados up to a height of 5 ft. 6 in. and stippled plaster for the remainder of the height. The floors in the hall on the ground floor and the corridors throughout are of patch pine blocks, and the floors of the class-rooms, basement and latrines are finished in granolithic paving, the entrance halls being paved with terrazzo. All external angles in the brickwork, woodwork, and plaster are rounded in order to prevent unnecessary damage to the fabric, and to avoid risk of accident to the children.

The final accounts of the building have not yet been completed, but it is estimated that the total cost, including a moiety of the cost of fencing, boundary walls, latrines, playsheds, and drainage works previously carried out in connection with the erection of the infants' department, will be approximately £11,200, or £13 6s. 8d. per head of the accommodation. It may be pointed out that, while no unnecessary ornamental work has been introduced in the erection of the building, there has been no elimination of items which are necessary, either in order to secure efficiency and hygienic conditions, or which tend to reduce, so far as possible, the cost of future upkeep.

The contractor was Mr. W. Lacey (Hounslow), and the electric light installation was undertaken by Messrs. J. B. Marr & Co., the hot-water engineers being Messrs. Haden & Sons.

Sewage Works Machinery.—Neither the war, nor the recent rebellion appear to have had any serious effect on municipal activities in South Africa, for we learn that the Ames Crosta Sanitary Engineering Company, Limited, 12 Victoria-street, Nottingham, have just had their tender accepted, in open competition, for supplying and installing sludge elevating machinery, gas engine, &c., for the Municipality of Johannesburg.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President: Mr. J. S. Pickering, M.Inst.C.E., Borough Surveyor and Water Engineer, Cheltenham.

DONCASTER MEETING.

A North-Eastern District meeting is to be held at Doncaster on Saturday, January 30th.

PROGRAMME.

2.30 p.m. Meet at the Mansion House. Short paper, "Some Notes on Extraordinary Traffic," by Mr. F. Oscar Kirby, M.Sc., Assoc.M.Inst.C.E., borough engineer, Doncaster.

4.30 p.m.—Tea, by kind invitation of his Worship the Mayor (Mr. S. Balmforth).

5.30 p.m. Business meeting.

(1) Correspondence.

(2) Minutes of last meeting held in Sheffield, May 2, 1914.

(3) Election of Executive Committee.

(4) Any other business.

In order that the necessary arrangements may be made, members must give notice not later than Tuesday, January 26th, of their intention to be present.

L. F. Wakefield, M.Inst.C.E.,
Hon. District Secretary.

Wakefield.

MEETING IN METROPOLITAN DISTRICT.

A meeting of the institution will be held at 92 Victoria-street, Westminster, on February 5th.

PROGRAMME.

8 p.m.—Presentation to the late secretary, Mr. T. Cole.

8.15 p.m.—Paper by Mr. H. D. Searles-Wood, F.R.I.B.A., on "Building Bye-laws and a Court of Appeal" (which will be taken as read).

Discussion.

Adjourned discussion on paper by Mr. W. H. A. Court, on "By-laws and the Housing Question," presented at the meeting at Hinckley on October 3, 1914.

Those attending should intimate their intention to the secretary on or before Wednesday, February 3rd, so that arrangements can be made and copy of paper forwarded.

Norman Scorgie, M.Inst.C.E.,
Hon. District Secretary.

Hackney.

ANNUAL MEETING.

June 24th, 25th and 26th (subject to alteration).

Papers or communications are cordially invited for discussion at the annual meeting to be held in London this year. The following subjects are suggested, but others will be welcomed:—

(1) The improvement and maintenance of highways in connection with modern traffic conditions.

(2) The use of reinforced concrete in buildings, road construction, &c.

(3) Town planning.

(4) Haulage by mechanical means *v.* horse power from an economical point of view.

(5) Restriction and control of heavy traffic both as regards weight and speed.

(6) The maintenance and strengthening of iron and steel bridges.

J. W. Dudley Robinson,
Secretary.

92 Victoria-street, S.W.

SOCIETY OF ENGINEERS.

At a meeting of the Society of Engineers to be held on Monday, February 1st, at the Institution of Electrical Engineers, Victoria Embankment, W.C. (south end of Savoy-street, near Waterloo Bridge), Mr. H. C. H. Shenton (president, 1914) will present the premiums awarded for papers published in the *Journal* during 1914.

Mr. Norman Scorgie, the president for 1915, will then deliver his presidential address.

The chair will be taken at 7.30 p.m. precisely.

A. S. E. Ackermann,
Secretary.

17 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. W. H. Matthews Jones, C.E., Engineer and Surveyor, Chester.

NO. 1 (NORTHERN) DISTRICT.

A meeting of the above district will be held at Hartlepool and West Hartlepool to-morrow (Saturday).

PROGRAMME.

1.15 p.m. Lunch at Central Grill, West Hartlepool (charge 2/- per head).

2.5 p.m. Leave Central Grill by tramcar for Central estate, Hartlepool; upon arrival, walk along Hartlepool Promenade past the Batteries and visit various parts of the town to inspect damage by recent bombardment.

3.30 p.m. Return to West Hartlepool and visit gas works, waterworks, and tram depots. If time permits inspect new swimming baths at Seaton.

4.45 p.m. Short business meeting in committee-room at municipal buildings.

JOHN ROBINSON,
Hon. Secretary.

Darlington.

Change of Address. Messrs. Mossay & Co., Limited, have removed from their premises at 45 Horseferry Road to Queen Anne's Chambers, Westminster, where they are continuing their engineering business. In announcing this the firm mention that they have made arrangements with Messrs. Ransomes, Sims & Jefferies, Limited, Orwell Works, Ipswich, for the manufacture of their (Messrs. Mossay's) design of electrically driven vehicles. Under these arrangements they are also acting as selling agents for these vehicles in the United Kingdom. A first series of chassis is already in hand.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ROAD SURVEYOR.—January 23rd.—East Lothian County Council. £200, with motor car and £100 for expenses.—Mr. J. D. Watson, Western District clerk, Haddington.

SURVEYOR'S ASSISTANT.—January 23rd.—Langport Rural District Council. £75 per annum. Mr. E. Q. Couch, clerk, Council Offices, Langport, Somerset.

CLERK OF WORKS.—January 25th.—Brighton Education Committee. £3 3s. per week.—Messrs. T. Simpson & Son, 16 Ship-street, Brighton.

TEMPORARY ASSISTANT.—January 26th.—Corporation of West Hartlepool. £110 per annum.—Mr. Nelson F. Dennis, borough engineer and surveyor.

CLERK OF WORKS.—January 27th.—Thame Rural District Council. £3 10s. per week.—Mr. H. Shaw, engineer and surveyor.

ASSISTANT SANITARY INSPECTOR.—January 27th.—Upton-upon-Severn Rural District Council. £65 per annum.—Mr. M. D. Price, surveyor and inspector.

SEWAGE WORKS SUPERINTENDENT.—January 29th.—Corporation of Leicester. £3 per week, with house.—Mr. E. George Mawbey, borough engineer and surveyor, Town Hall, Leicester.

ASSISTANT.—January 30th.—Cudworth Urban District Council. £80 per annum.—Mr. W. T. Lynam, surveyor and inspector, Council Offices, Cudworth, near Barnsley.

HIGHWAY SURVEYOR.—February 1st.—Newton Abbot Rural District Council. £150 per annum.—Mr F. Horner, clerk, Council Offices, Newton Abbot.

FOREMAN.—February 6th.—Corporation of Batley. 50/- per week. Mr. J. H. Crack, town clerk.

ENGINEERING ASSISTANT.—February 6th.—Corporation of Birkenhead. £120—£150 per annum.—Mr. C. Brownridge, borough engineer and surveyor, Town Hall.

CHIEF SANITARY OFFICER.—February 15th.—Jharia Board of Health, India. £80—£100 per month.—Mr. S. R. Hignall, deputy commissioner of Manbhum, and chairman of the Jharia Board of Health, Purulia, B.N.Ry., Bihar and Orissa, India.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

CLERK OF WORKS.—Herts County Council. £3 per week.—The County Surveyor, Hatfield, Herts.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SHEPSHED.—January 25th.—For the erection of working-class houses, for the urban district council.—Mr. M. Smith, clerk, Shepshed, Leicester.

CLUTTON.—February 23rd.—Schemes for providing a public water supply, for the parishes of Chelwood, Chew Magna, Chew Stoke, Norton, Malreward, Publow, and Stanton Drew, for the rural district council. Premiums of £100 and £50 will be awarded to the first and second best competitors.—Mr. J. Sumner Dury, clerk, Temple Cloud, Bristol.

WALTHAMSTOW.—Plans for the erection of workmen's dwellings at an estimated cost of £16,000, for the urban district council.—Mr. C. S. Watson, clerk, Town Hall.

BRADFORD.—Designs for the re-planning of streets in the central area of the city, for the corporation. Mr. Reginald Blomfield, R.A., has been nominated assessor.—Mr. F. Stevens, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

PRESTON (Sussex).—January 25th.—For the erection of four cottages, for the rural district council.—Mr. A. Shelley, Littlehampton.

BECKENHAM.—January 25th.—For culverting a stream and the construction of a culvert, for the urban district council.—Mr. J. A. Angell, surveyor.

LUDLOW.—January 26th.—For the erection of twenty-two cottages, for the corporation.—Mr. J. Butters, architect, Ludlow.

STAFFS.—January 26th.—For the erection of a farm institute, for the Education Committee.—Mr. Graham Balfour, director of education, Stafford.

LONDON.—January 26th.—For building an engine-house and other works at Poplar, for the county council.—Chief Engineer, Spring-gardens, S.W.

IRVINE.—January 26th.—For the erection of buildings at Greenhead filters, for the Irvine and District Water Board.—Mr. H. Thomson, architect, Saltcoats.

ROCHDALE.—January 27th.—For the erection of [illegible] for the [illegible].—Mr. P. W. Hathaway, Town Hall.

GLASGOW.—January 27th.—For extensions to the Couper Institute, for the corporation.—Office of Public Works, 61 Cochrane-street, Glasgow.

TRURO.—January 28th.—For the construction of a new roof over the council chamber and adjoining rooms, for the corporation.—Mr. F. A. Barnes, city engineer.

UPHOLLAND.—January 30th.—For the erection of eight workmen's houses, for the urban district council.—Mr. A. Hunt, surveyor.

ELY.—January 30th.—For the erection of a residence, with workmen's dwellings, for the corporation. Mr. J. A. Smith, borough engineer.

HARROW.—January 26th.—For the erection of a boiler, for the urban district council. Mr. J. P. Reynolds, engineer and surveyor.

TOTTENHAM.—January 29th.—For the erection of workshops, for the Education Committee. Messrs. E. P. Lawrence & Buckingham-street, Adelphi, W.C.

GOREY (Ireland).—January 29th.—For the erection of cottages, for the rural district council. The Clerk, Gorey Workhouse.

GREAT TORRINGTON.—February 1st.—For the removal of cottages and the erection of five dwelling-houses, for the corporation. Mr. W. C. Maillard, council's surveyor.

LONDON.—February 2nd.—For the supply of cooking materials, for the Prison Commission. Home Office, Whitehall, S.W.

LONDON.—February 2nd.—For the removal of Lambeth Green buildings, for the London County Council. Clerk of the Works, County Hall, Spring-gardens, S.W.

SHEFFIELD.—February 2nd.—For the supply of a steam rammer and engine, for the Lodge Supply Committee. Lodge Supply Office, Commercial-street, Sheffield.

PORTSMOUTH.—February 8th.—For the erection of a hospital, for the corporation. Mr. G. H. Hughes, town clerk.

CONGLETON.—February 4th.—For the erection of a school, for the Congleton Urban Council. Messrs. T. Price & Son, architects, Sandbach.

GLOUCESTER.—February 9th.—For the construction of tar-filled macadam roadway, and for other road works, for the corporation. Mr. F. Cook, city engineer, Guildhall, Worcester.

TEWKESBURY.—February 10th.—For the erection of six cottages, for the rural district council. Messrs. Prothero, Phillott & Barnard, 31 Promenade, Cheltenham.

LAMBETH.—January 11th.—For the supply and renewal of the iron and lead gutters, and also for the repair of the lanterns to the stable roof of the depot buildings, for the borough council. Mr. H. Lovell, borough engineer, Town Hall, Brixton-hill, S.W.

RADCLIFFE.—February 13th.—For the erection of sixteen houses, for the urban district council. Mr. W. L. Rothwell, engineer and surveyor.

ST. HELENS.—February 23rd.—For the erection of a refuse destructor, for the corporation.—Mr. A. W. Bentley, borough engineer.

BOMBAY.—March 7th (date extended).—For the erection and equipment of a refuse destructor, for the Municipal Commissioner. Messrs. Henry S. King & Co., 65 Cornhill, London, E.C.

Iron and Steel.

SHEFFIELD.—January 25th.—For the supply of tie bars, for the Tramways Committee.—Mr. W. J. Hadfield, city surveyor.

EDMONTON.—January 26th.—For the supply of 95 tons of British rolled-steel joists, and 300 yds. run of wrought-iron railing, for the urban district council. —Mr. C. Brown, engineer.

WIGAN.—January 26th.—For the supply of 10 tons of tramway rails, for the corporation.—Mr. A. T. Gooseman, borough engineer.

LONDON.—January 26th.—For the supply of tramway rails and fastenings, for the county council. Mr. G. W. Humphreys, chief engineer, Spring-gardens, S.W.

NANTWICH.—January 28th.—For the supply of about 2,100 tons of cast-iron water pipes, branches, and other pieces, hydrants, sluice valves, fittings, and excavating and laying about 50 miles of cast-iron water mains, for the rural district council.—Mr. C. E. Davenport, 152 Hospital-street, Nantwich.

Roads.

HENDON.—January 25th.—For road widening and wood and stone paving works, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

SLEAFORD.—January 26th.—For the supply of granite and slag, for the rural district council.—Mr. E. H. Godson, clerk, 74 Southgate.

BECKENHAM.—January 25th.—For making up St. George's-road, for the urban district council.—Mr. [illegible] Arnold, surveyor.

BIRMINGHAM.—January 25th.—For making up a road, for the Public Works Committee.—Mr. H. E. Stilgoe, engineer and surveyor.

RUNCORN.—January 25th.—For the supply of road materials, for the rural district council. [illegible] Surveyor.

PETERBOROUGH.—January 25th.—For the supply of granite, basalts, granite chippings, slag dust, tar-macadam, pitch, tar, local stone, and gravel, for the county council. Mr. A. C. Wallingford, county surveyor, 15 Priestgate, Peterborough.

PETERBOROUGH.—January 26th.—For [illegible] and surfacing a main road, for the county council. Mr. A. C. Wallingford, county surveyor, 15 Priestgate, Peterborough.

WEST HAMPSTEAD.—January 24th.—For the supply of road materials, for the urban district council. —Mr. W. D. Rusell, clerk, 5 South-street, Chichester.

CHERITON.—January 26th.—For making up a road, for the urban district council. Pearle Oil, Cheriton.

BARKING.—January 26th.—For road widening, for the urban district council.—Mr. R. A. Lay, acting surveyor, Public Offices, Barking.

CLUTTON.—January 26th.—For the supply of about [illegible] specification for tar, No. 2, for the rural district council. Mr. J. Sumner Drury, clerk, Temple Cloud, Bristol.

CARDIGANSHIRE.—January [illegible] ing and surfacing the Cardigan to Cenarth main road with Welsh granite, and tar-spraying, for the county council.—Mr. David Davies, county surveyor's office, Felinfach, S.O.

BARNET.—January 27th.—For the supply of a 10-ton steam roller with scarifier, for the urban district council.—Mr. W. B. Chancellor, engineer and surveyor, 10 Hadley-road.

ESSEX.—January 27th.—For the supply of stone-ware pipes, [illegible] kerb, distilled tar, and team labour, for the Highways Committee. Mr. P. [illegible], county surveyor, Chelmsford.

FULHAM.—January 27th.—For making up Nella-road, for the borough council.—Mr. F. Wood, borough surveyor.

LLANTRISANT.—January 27th.—For the supply of road materials, for the rural district council.—Mr. T. Saunders, surveyor, School-street, Pontyclun.

ROCHDALE.—January 27th.—For making up certain streets, for the corporation.—Borough Surveyor.

NESTON.—January 27th.—For the supply of broken stone, chippings, tarred macadam, kerbs, and setts, for the urban district council.—The Surveyor, Town Hall, Neston, Cheshire.

HERNE BAY.—January 27th.—For making up certain streets, for the urban district council.—Mr. F. W. J. Palmer, surveyor.

LARNE.—January 28th.—For the supply of whinstone, and also a steam roller and scarifier, for the urban district council.—Mr. W. G. Younge, clerk, Town Hall, Larne.

OTLEY.—January 29th.—For the supply of granite, limestone, tar-macadam, slag dust, setts, kerb, flags, pitch, and hauling stone, for the urban district council.—Mr. C. F. Hodgson, surveyor.

BRIDGWATER.—January 30th.—For the supply of road stone, for the rural district council.—Mr. W. A. Collins, surveyor, 56A Eastover, Bridgwater.

BRACKLEY.—January 30th.—For the supply of granite for the year ending March 31, 1916, for the corporation. Mr. A. A. Green, borough surveyor, Brackley, Northants.

SOUTHAMPTON.—January 30th.—For the supply of British macadam, for the rural district council.—Mr. F. Heather, district surveyor, Chevin Side, Old Portswood, Southampton.

SOUTH STONEHAM.—January 30th.—For the supply of British macadam, for the rural district council.

—Mr. C. Cecil Dominy, clerk, 20 Portland-street, Southampton.

HERTFORDSHIRE. January 30th. For supply of wood and granite-sett paving, for the county council.—Mr. J. S. Killick, county surveyor.

LANARK. January 30th. For the supply of road metal and carting, for the Lower Ward.—Mr. J. A. McCallum, district clerk, 15 West George-street, Glasgow.

HERTS. February 1st. For the supply of hand-picked surface flints, dug gravel, hoggin, shingle, sand and team labour, for the county council.—Mr. J. S. Killick, county surveyor, Hatfield.

SOMERSET.—February 1st.—For the supply of broken granite or basalt, and steam rolling, for the county council.—Mr. E. Stead, county surveyor, Wells.

SUTTON-IN-ASHFIELD.—February 1st.—For the supply of tar-macadam and broken slag, for the urban district council.—Mr. W. Burn, surveyor.

PORTSLADE.—February 2nd.—For the supply of granite chippings, for the urban district council.—Mr. A. Taylor Allen, surveyor.

ESCRICK.—February 2nd. For the supply of best whinstone, tar-macadam, slag, granite, grouting tar, and spraying tar, for the rural district council.—Mr. J. R. Hudson, surveyor, 4 Heslington-road, York.

EAST GRINSTEAD.—February 2nd. For the supply of sand or grit, for the rural district council.—Mr. F. S. White, clerk, 6 High-street, East Grinstead.

CHINGFORD.—February 2nd.—For the supply of road materials, for the urban district council.—Mr. L. C. Bowen, clerk, 34 Station-road, Chingford.

MIDDLESBROUGH.—February 2nd.—For the supply of whinstone, limestone, and tarred slag and whinstone for macadamising, for the rural district council.—Mr. W. H. Dixon, district surveyor, Kirkby-in-Cleveland, near Stokesley, Yorks.

CARSHALTON.—February 3rd.—For making up certain roads, for the urban district council.—Mr. W. W. Gale, surveyor.

MIDDLESEX.—February 3rd.—For the supply of about 7,500 tons of 2-in. and 1½-in. hand-broken basalt, and 500 tons of ⅜-in. chippings, for the county council.—Mr. H. T. Wakelam, county engineer, Middlesex Guildhall, Westminster.

CUCKFIELD.—February 3rd.—For the supply of about 7,000 tons of broken granite, tarred material, and flints, for the rural district council.—Mr. A. MacArthur, surveyor, Council Offices, Haywards Heath.

STOKESLEY.—February 4th.—For the supply of whinstone, limestone, and tarred slag and whinstone for macadamising, for the rural district council.—Mr. W. H. Dixon, district surveyor, Kirkby-in-Cleveland, near Stokesley, Yorks.

HORNCASTLE.—February 6th.—For the supply of granite and slag, for the rural district council.—Mr. J. E. Chatterton, clerk.

HERTS.—February 8th.—For the surface-tarring of main roads, for the county council.—Mr. J. S. Killick, county surveyor, County Surveyor's Office, Hatfield.

WALTHAM.—February 8th.—For the supply of granite, flints, gravel, hoggin, ballast, sand, tar-macadam, and tar-spraying, for the urban district council.—Mr. W. C. Holloway, engineer and surveyor, Town Hall, Waltham Abbey.

LONDON.—February 9th.—For paving works, for the London County Council.—Chief Engineer, County Hall, Spring-gardens, S.W.

BRADFORD.—February 10th.—For the cartage of road material and team labour, for the corporation.—Mr. W. H. S. Dawson, city engineer and surveyor.

CANTERBURY.—February 11th.—For the supply of road materials, for the corporation.—Mr. A. C. Turley, city surveyor.

HAILSHAM.—February 13th.—For the supply of road materials and cartage, for the rural district council. — Mr. E. Catt, clerk, 17 London-road, Hailsham.

TANGIER.—February 20th.—For works of road construction and improvement, for the Special Committee of Public Works. — Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

MARPLE.—February 22nd.—For the supply of granite macadam and chippings, Macclesfield macadam and chippings, limestone macadam and chippings, 6-in. setts, and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor, Council Offices, Marple.

LITTLE HULTON.—February 22nd.—For the supply of broken granite, granite setts, granite, limestone and slag chippings, grit kerbs, and steam road rolling, for the urban district council. Mr. J. H. Heyes, clerk.

Sanitary.

DISLEY.—January 25th.—For laying 2,300 lin. yds. of 9-in. stoneware and cast-iron sewers and manholes, for the rural district council.—Mr. C. S. Righton, engineer, 18 Market-street, Marple.

ROWLEY REGIS.—January 25th.—For relaying sewer and storm-water drain, and other works, for the urban district council.—Council House, Old Hill.

TROON.—January 25th—February 1st.—For the construction of main sewer, outfall sewer, 24-in. cast-iron concentrating sewer, and screening chamber, for the corporation.—Messrs. J. & H. V. Eaglesham, engineers, 24 Wellington-square, Ayr.

WEST SUFFOLK.—January 25th.—For the construction of a 6-in. stoneware drain, soakaway pit, and other works, for the county council.—Mr. W. L. Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

RUNCORN.—January 25th.—For laying socket pipe sewers, for the urban district council.—Mr. J. Wilding, surveyor and water engineer.

ST. ALBANS.—January 27th.—For the construction of concrete sedimentation and humus tanks, primary and secondary bacteria beds, necessary drains, connections, extension of buildings, and alteration to existing bacteria beds, for the corporation.—Mr. Howard Humphreys, consulting engineer, 28 Victoria-street, Westminster, S.W.

CHAILEY.—January 29th.—For works of sewerage, for the rural district council.—Mr. H. Bertram Nichols, engineer, 11 Victoria-street, Westminster, S.W.

COCKERMOUTH.—January 29th.—For laying 3,600 yards of sewers, constructing manholes, and other works, for the rural district council.—Mr. J. B. Wilson, Grecian Villa, Cockermouth.

PENDLEBURY.—January 30th.—For the construction of sewers and manholes, for the urban district council.—Mr. H. Entwistle, engineer and surveyor, Council Offices, Swinton, Manchester.

MANCHESTER.—February 1st.—For the construction of a connection with Middleton sewers, for the corporation.—City Surveyor, Town Hall.

ALNWICK.—February 8th.—For supplying and laying earthenware pipes, for the rural district council.—Mr. F. Wade, Embleton.

LEEDS.—February 8th.—For the supply of cement, earthenware drain pipes, sewer ironwork, galvanised dirt boxes, and sewer ventilating columns, for the corporation.—Mr. W. T. Lancashire, city engineer, Municipal Buildings.

WIRRAL.—February 12th.—For the construction of stoneware pipe sewers and other works, for the rural district council.—Mr. W. W. Sherman, 9 Hamilton-square, Birkenhead.

RADCLIFFE—BURY.—February 13th.—For the extension of the sewerage systems, for the Radcliffe Urban District Council and the Bury Rural District Council.—Mr. W. L. Rothwell, engineer, Radcliffe.

WOKING.—February 22nd.—For the construction of three screening chambers and detritus tanks, three sedimentation tanks, fifteen circular bacteria beds, provided with automatic distributors, six humus tanks, various lengths of effluent carriers, engine-house, sludge pump and press-house, and engine-houses for driving screens and pumping humus, and other works, for the urban district council.—Mr. G. Midgley Taylor, Caxton House, Westminster, S.W.

Stores.

LEIGH.—January 25th.—For the supply of grit setts, kerbstones, channel stones, macadam, chippings, sewerage pipes, castings, pitch, and creosote oil, for the corporation.—Mr. Tom Hunter, borough engineer and surveyor, Town Hall, Leigh, Lancs.

NORTHAMPTON.—January 25th.—For the supply of broken granite, granite kerb, setts, artificial stone paving, stoneware pipes, gullies, Portland cement, lime, ironmongery, wrought iron, steel, tar-paving, tar-macadam, blue bricks, gravel, sand, brooms, brushes, coal, coke, iron castings, timber, and team labour, for the corporation.—Mr. Alfred Fidler, borough engineer.

WILLESDEN.—January 26th.—For the supply of paving, road material, tar paving, tar-macadam, and tar for use on roads, house rails, fences, etc., granite chippings, broken granite, stone, etc., for the urban district council.—Mr. C. Bolton, engineer and surveyor, Municipal Offices, Dyne-road, Kilburn, N.W.

CHISWICK.—January 27th.—For the supply of oils, motor spirit, drysaltery, ironmongery, disinfectants, alumino-ferric or copperas, lime, cement, Kentish pit flints, hoggin, blue Guernsey granite, and other broken road stone, York and other paving, tarred granite slag and limestone paving, tar, asphalt, pipes, gullies, sludge presses, and hire of horses and drivers, for the urban district council.—Mr. Edward Willis, surveyor, Town Hall.

OTLEY.—January 29th.—For the supply of granite, limestone, tar-macadam, slag dust, setts, kerb, flags, pitch, brushes, coal, and hauling stone, for the urban district council.—Mr. C. F. Hodgson, surveyor, Council Offices, Otley.

GRIMSBY.—January 29th.—For the supply of chalk, whinstone macadam, artificial flags, Yorkshire flags, Yorkshire kerbs, granite setts, granite kerbs and channel, pitch, coal-gas tar, Buxton quicklime, blue lias lime, dog-kennel lime, Portland cement, drainage pipes, brushes, drysalteries, oils, paints, disinfectant fluid, disinfectant powder, and formalin, for the corporation.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

FROME.—January 30th.—For the supply of scavenging brushes, Portland cement, broken limestone, broken granite, tarred material, tools, kerbing, channelling, pennant and concrete flagging, and coal, for the urban district council.—Mr. F. W. Jones, Public Offices, Frome.

WIGAN.—January 30th.—For the supply of [illegible] horse brush stocks and brushes, Portland cement, lime, common bricks, stoneware pipes, gullies, pitch, and creosote oil, manhole and gully grates, iron and tools, timber, oils and paints, glass and glazing, ironmongery, grit setts, kerbstones, channel stones, flags, gravel, chippings, and macadam, for the corporation.—Mr. A. T. Gooseman, borough engineer and surveyor.

CHELTENHAM.—January 30th.—For the supply of Portland cement, forage, stoneware pipes, broken stone, disinfectants, oils, colours, ironmongery (including tree guards), timber (including wheelbarrows and street orderly trucks), india-rubber goods, lead, brass fittings, tools for highways, wrought iron, steel files, electric lighting fittings, lias lime, and bricks, for the corporation.—Mr. J. S. Pickering, borough surveyor.

HUDDERSFIELD.—January 30th.—For the supply of granite setts, gritstone setts, granite macadam, furnace slag (broken and unbroken) for highway purposes, granite slag and limestone tar-macadam, flags, [illegible] kerbs, pitch and creosote oil, [illegible] materials, Portland cement, bricks, lime, and river sand, hay, straw and pot-ash, [illegible] brushes and brooms, earthenware pipes, [illegible] goods, house coal for highways department [illegible] (for all districts), shoeing horses, oils (engine, cylinder, gas engine, heavy bearing and petroleum), for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor, 1 Peel-street, Huddersfield.

OSSETT.—February 1st.—For the supply of materials, stores, and workmen's tools required in the highways, gas, lighting, water, sanitary and educational departments, for the corporation.—Borough Surveyor.

YORK.—February 1st.—For the supply of Portland cement, pitch and creosote oil, stoneware pipes, building lime, Yorkshire-stone flags, kerbing and edging, whinstone and limestone chippings, for the corporation.—Mr. F. W. Spurr, city engineer.

WOOLWICH.—February 10th.—For the supply of ballast, sand, brooms, brushes, cement, chandlery, drain pipes, forage, granite kerb, harness, ironmongery, road material, sewer ironwork, and timber, for the borough council.—Mr. J. Rush Dixon, borough engineer, Town Hall, Woolwich.

Miscellaneous.

SOWERBY.—January 27th.—For the supply and erection of filtration plant, for the proposed new baths.—Mr. James Eastwood, engineer and surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance
‡ Provisionally accepted.

BOLSOVER.—For the supply of Hartshill stone and chippings for the rural district council.
W. Iveson & Son, Normanton.*
Judkin, Limited, Normanton.*
G. Abell, Limited, Normanton.*
Jno. Hartshill, Normanton.
Mercaston Granite Company, Otherstone.
Mountsorrel Granite Company, Mountsorrel.*
Enderby and Stoney Stretton Granite Company, Leicester.
G. H. Gray & Company, Leicester.
W. Twigg & Company, Leicester.
Midland Granite Company.
Swithland Granite Company.
W. L. Tippetts & Company, Otherstone.
Castle Hill Granite Company, Markfield, Leicester.
Ratcliffe Stone Company, Stanton.
Charnwood Granite Company.

LEATHERHEAD.—Accepted for the erection of a sanatorium, for the corporation.—Mr. C. Brewerridge, borough engineer and surveyor.

A. Francis Nesten, £7,000.

DOVER.—Accepted for the collection and disposal of house refuse, for the corporation.—Mr. W. C. Hawke, borough engineer.

W. J. Kennett, Dover, £25.

HAPPISBURGH.—For carting work in Waxham-cum-Palle part of, for the urban district council.—Mr. John H. Leverton, surveyor:—
G. & E. Bell ... £ s.
W. Longwood ... 329
T. C. Jarvis ... 304
W. Brumpet ... 196
A. J. Pearson ... 140

Surveyor's estimate, £204.

LEEDS.—For building an administrative block at the small-pox hospital, for the corporation.—Mr. W. T. Lancashire, city engineer:—
W. Rogerson & Co., York-road, Leeds, £14,685.

MIDDLETON.—Accepted for the supply of about 1,400 tons of kerb & granite setts, for the corporation.—Mr. William Wesson, borough surveyor.
Penmaenmawr and Welsh Granite Company, Penmaenmawr.
Pwllheli Granite Company, Runcorn.
Brookes, Limited, Manchester.

ST. ANNES-ON-SEA.—For the construction of an open-air swimming bath, for the urban district council.—Mr. E. Harrison, architect, Accrington:—
E. Shepherd, Derwen ... £1,949
[illegible] & Sons, Preston ... 8,900
Martin Brothers, Rawtenstall ... 8,817
J. Taylor, Blackpool ... 8,820
Lewis & Son, Blackburn ... 8,799
Smith Brothers, Rawtenstall ... 8,750
Cordingley & Son, Limited, Accrington ... 8,499
H. Pemberton & Son, Limited, Accrington ... 8,350
W. Eaves & Co., Limited, Blackpool* 8,325

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JANUARY.

27.—Institution of Mechanical Engineers.—Mr. John Dewrance on "Standardisation of Pipe Flanges and Flanged Fittings." 8 p.m.

28.—Institution of Municipal Engineers.—Northern District Meeting at Hartlepool and West Hartlepool.

28.—Institution of Civil Engineers.—Discussion of Mr. A. Langley Bell's paper, "The Lateral Pressure and Resistance of Clay, and the Supporting Power of Clay Foundations," paper to be read "Engineering Operations for the Prevention of Malaria," by Mr. P. Dudley Evans. 8 p.m.

29.—Institution of Municipal Engineers: Council Meeting, London.

30.—Institution of Municipal and County Engineers: North-Eastern District Meeting at Doncaster.

FEBRUARY.

1.—Society of Engineers.—Mr. Norman Scorgie, Borough Engineer of Hackney, delivers his Presidential Address; Presentation of Premiums. 7.30 p.m.

[illegible].—Institution of Municipal and County Engineers: Meeting at 32 Victoria-street, S.W., 8 p.m.

13.—Institution of Municipal Engineers: Northern District Annual Dinner, Newcastle-on-Tyne.

19-20.—Royal Sanitary Institute: Meeting at Manchester.

23.—County Councils Association: Annual Meeting. 3 p.m.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

HERTFORDSHIRE COUNTY COUNCIL.
Clerk of Works Wanted for large Softwood Paving Contract in Hertfordshire. Must have had experience in similar work, and be thoroughly acquainted with qualities of Timber. Salary £3 per week.

Applications, accompanied by testimonials, to be forwarded at once to the County Surveyor, Hatfield, Herts. (2,272)

CORPORATION OF LEICESTER.
SEWAGE WORKS SUPERINTENDENT.

The Sewage Works and Farms Committee of the Corporation of Leicester invite applications for the appointment of Superintendent of the Effluent and Sludge Pumping Station and Bacterial Works at their Beaumont Leys Sewage Farm, to act under the direction of the Borough Surveyor.

Applicants must be qualified practical mechanical engineers, and have had experience in the running and overhauling of high-speed engines and centrifugal pumps. It is essential that they should also have had experience in the running of electrical plant.

Candidates should state full particulars of their experience in the supervision of sewage disposal works.

The successful candidate must be a married man, and reside in the house which is provided on the farm.

Salary £3 per week, with house, rates, water and coal free.

Applications, stating age and present occupation, with copies of at least three recent testimonials, and endorsed "Sewage Works Superintendent," are to be addressed to the undersigned, and delivered at the Town Hall, Leicester, not later than Friday, January 29th, 1915.

E. GEORGE MAWBEY, M.INST.C.E.,
Borough Engineer and Surveyor.

Town Hall, Leicester.
January 18, 1915. (2,274)

CUDWORTH URBAN DISTRICT COUNCIL.
The above Council require the services of an Assistant in the Offices of their Surveyor and Sanitary Inspector.

Candidates must have been properly trained in the Office of a Municipal Engineer. Sanitary Inspector's Certificate desirable.

Salary £80 per annum.

Applications, in candidate's own handwriting, stating age and experience, accompanied by copies of not more than three recent testimonials, to be sent to the undersigned not later than January 30, 1915, endorsed "Assistant."

W. T. LYNAM,
Surveyor and Inspector.

Council Offices,
Cudworth, near Barnsley. (2,268)

COUNTY BOROUGH OF BIRKENHEAD.
The Corporation of Birkenhead invite applications for the position of Engineering Assistant in the Borough Engineer and Surveyor's Department, at a salary of £120 per annum, rising by annual increments of £5 to £150 per annum.

Candidates must have had experience in a Municipal Engineer's Office, and be not less than 21 years, nor more than 35 years of age.

Preference will be given to candidates who have passed Studentship Examination of Institution of Civil Engineers, or similar examination.

Applications, in candidate's own handwriting, stating age and experience, and accompanied by copies of not more than three recent testimonials, sealed and endorsed "Assistant, Surveyor's Department," must be delivered at the Office of Mr. Chas. Brownridge, M.INST.C.E., Borough Engineer and Surveyor, Town Hall, Birkenhead, by 12 noon on Saturday, the 6th February, 1915.

Canvassing will be deemed a disqualification. (2,277)

NEWTON ABBOT RURAL DISTRICT COUNCIL.
The Council require the Services of a Highway Surveyor for the Southern Sub-district, which comprises 16 parishes, with about 40 miles of main roads and 210 miles of district roads.

The salary will be at the rate of £150 per annum, and will include all travelling and other expenses, except stationery and postages.

The appointment will be subject to the approval of the Main Roads Committee of the Devon County Council.

Candidates must have had not less than two years' experience as a Highway Surveyor, and the person appointed must devote his whole time to the duties, and give security in an approved guarantee society in the sum of £200 for the faithful discharge of his duties.

Application, in candidate's own handwriting, stating age and previous experience, with copies of not more than three testimonials of recent date, to be sent to me on or before 12 o'clock on Monday, the 1st day of February, 1915.

(By order)
FRED HORNER,
Clerk.

Council Offices,
Newton Abbot.
January 16, 1915. (2,275)

APPOINTMENTS WANTED.

ADVERTISER wishes negotiations with Manufacturers or Contractors desirous of introducing their Specialities or developing their Trade with Municipal Authorities, Home and Foreign Railways, Steamship Companies, Export Merchants, &c.

An influential connection and the advantages of own London Offices and Showroom placed at their disposal upon favourable terms.—Address Box M.866, c/o W. Dawson & Sons, Limited, 121 Cannon-street, E.C. (2,279)

TENDERS WANTED.

WILLESDEN DISTRICT COUNCIL.
ANNUAL CONTRACTS.

The Willesden District Council are prepared to receive Tenders from persons willing to enter into Annual Contracts, commencing April 1st, 1915, to Execute the following Works or to Supply the following Materials viz.:—

1. Jobbing Works in Construction of Sewers, &c.
2. Supply of Artificial Slab Paving.
3. Supply of Tar Paving and Execution of Tar-paving Works.
4. Supply of Horses, Carts and Drivers, for cartage of various descriptions.
5. Supply of Gravel, Flints, Burnt Ballast, &c., for repair of roads, &c.
6. Supply of Broken Granite for repair of roads, &c.
7. Supply of Lime, Cement, Salt-glazed Ware Pipes, &c.
8. Supply of Oils and Chandlery.
9. Supply of Coal and Coke.
10. Barging of Road Slop, &c., from Fermoy Wharf.
11. Supply of Horse Provender.
12. Supply of Ironmongery and Tools.
13. Supply of Timber.
14. Wood-paving Works.

Specifications and Forms of Tender may be obtained upon receipt of 5s. for each Tender Form, on and after Monday, January 18th, 1915, upon application to Mr. O. Claude Robson, M.INST.C.E., Engineer to the Council, Municipal Offices, Dyne-road, Kilburn, N.W. The deposit for Tender Form will be returned upon receipt of a *bonâ-fide* Tender.

Tenders to be delivered to the undersigned not later than 4 p.m. on Tuesday, January 26th, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
STANLEY W. BALL,
Clerk of the Council.

Municipal Offices,
Dyne-road, Kilburn, N.W.
January 12, 1915. (2,260)

Calno
Reg.d

THE ONLY FIRE-RESISTING FIBRE
BUILDING BOARD
MADE IN
GREAT BRITAIN

Does not Split or Crack. Bound with Cement Binder.
Tensile Strength over 300lb. to the square inch

TESTED AND CERTIFIED by the BRITISH FIRE-PREVENTION COMMITTEE.

PASSED by the L.C.C.

Fire and Damp Resisting.

Germ and Sound Proof.

Non-conductor of heat or cold.

Sanitary.

Over 5,000,000 (five million) Square Feet in use by H.M. Government.

Address: **Thames Mills, Purfleet, Essex**
Tel. [illegible] { 11 Tilbury. / 22 Rainham. Telegrams [illegible]

THE FIREPROOF FIBRE BUILDING BOARDS, LTD.,
Telegrams "[illegible]" [illegible] 26 Hart Street, London, W.C.

JOHN **YATES** & CO., Ltd.,
Aston Manor, BIRMINGHAM,
MANUFACTURERS SINCE 1804
OF EVERY DESCRIPTION OF
TOOLS & PLANT
FOR PUBLIC AUTHORITIES & CONTRACTORS.

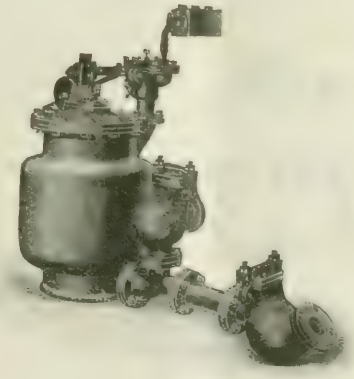
ALL BRITISH

EVERYTHING for the MAKING of ROADS and SEWERS and MAIN-LAYING.

ALL BRITISH TIP WAGONS, TRACK and CRANE SKIPS.

ALL BRITISH DIAPHRAGM PUMPS & HOSE, &c.

"J. & A." Pneumatic Ejectors.



As installed for raising sewage at—
ALDERMASTON, nr. Reading.
BINGLEY, Yorks.
ASHTON-IN-MAKERFIELD, Lancs.
West London District Schools, ASHFORD, Middlesex.

. High Efficiency .
Minimum Attention
. Easily Handled .

Low running and prime costs.

Write to-day for Ejector Catalogue S2.

Jones & Attwood, Ltd., HYDRAULIC ENGINEERS, **STOURBRIDGE.**

Telegraphic Address: "HEAT, STOURBRIDGE." Telephone: No. 10.

METROPOLITAN BOROUGH OF WOOLWICH.

SUPPLY OF ROAD MATERIAL, FORAGE, STORES, &c.

The Council of the Metropolitan Borough of Woolwich are prepared to receive Tenders for the Supply of the under-mentioned Road Material, Forage, Stores, &c., from the 1st April, 1915, to 31st March, 1916:—

1. Ballast, Sand, &c.
2. Brooms, Brushes, &c.
3. Cement.
4. Chandlery.
5. Drain Pipes.
6. Forage (for six months from 1st April, 1915).
7. Granite Kerb.
8. Harness.
9. Ironmongery.
10. Road Material.
11. Sewer Ironwork.
12. Timber.

Forms of Tender, with Schedules and further particulars, can be obtained at the Office of Mr. J. Rush Dixon, M.INST.C.E., Borough Engineer, Town Hall, Woolwich.

The persons or firms tendering will be required to make a declaration that they have paid, and will pay, trades union rates of wages, and have observed, and will observe, trades union hours of labour upon all work carried out for the Council. The persons or firms whose Tenders are accepted will be required to enter into formal Contracts.

Samples may be inspected at the Town Hall, Woolwich, between 9 a.m. and 1 p.m., and 2 p.m. and 5 p.m. (Saturdays 9 a.m. to 1 p.m.). No Tender will be considered in cases where Samples are provided unless the tenderer or his agent has inspected them and signed the book to that effect. No Tender will be considered unless on the authorised Form of Tender.

Sealed Tenders, based on properly priced-out Schedules, must be delivered to me at the Town Hall, Woolwich, not later than 12 o'clock noon on Wednesday, the 10th February, 1915, in envelope endorsed "Tender for ——."

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

ARTHUR B. BRYCESON,
Town Clerk.

Town Hall,
Woolwich.
January 19, 1915. (2,278)

TO STONE MERCHANTS, QUARRY OWNERS, PIPE MAKERS, AND OTHERS.

MARPLE URBAN DISTRICT COUNCIL.

The above Council invite Tenders for the Supply of the following Material during the year ending March 31, 1916—viz.:—

1. Granite Macadam and Chippings.
2. Macclesfield Macadam and Chippings.
3. Limestone Macadam and Chippings.
4. Six-inch Setts.
5. Sanitary Pipes.

Specifications and Forms of Tender, together with any further information, may be obtained from Mr. D. J. Diver, the Council's Surveyor, Council Offices, Marple, to whom Samples must be forwarded.

Tenders, addressed to "The Chairman of the Council," to be delivered at the Council Offices, Marple, before 12 o'clock noon on Monday, the 22nd February next.

(By order)

J. W. RAMSBOTTOM,
Clerk to the Council.

Council Offices,
Marple.
January 19, 1915. (2,276)

Specify

Mexphalte and Fluxphalte for your 1915 road work.

These materials have increased in sales and reputation during the past season. There is no shortage of supplies or increase in prices. Mexphalte is unrivalled for grouting work and for asphalte macadam. Fluxphalte is a liquid bitumen for road spraying. Prompt deliveries from stock at competitive prices.

ANGLO-MEXICAN PETROLEUM PRODUCTS CO., LTD.,

FINSBURY COURT, LONDON, E.C.

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. JANUARY 29, 1915. No. 1,202.

Municipal Engineering in 1914.

The appreciation with which our Special Annual Issue has been received in former years has induced us upon the present occasion to extend the limit which has by now become so familiar to our readers. Our annual review of municipal engineering work is therefore once again comprised in a series of articles, each of which has been specially written by an expert in the subject with which it deals, while this introduction will serve to point out some of the most salient features of the year's work. The reader of the articles which follow will at once observe that the far-reaching effects of the European war have extended into almost every branch of municipal engineering work. For example, the exigencies of military transport have caused earnest attention to be given to problems connected with the strengthening of roads and bridges, the trade upheaval has opened new markets for manufacturers of pumps and water mains; in the realm of architecture the international competition in connection with the proposed Australian Federal Parliament House has been postponed, and the search for improved methods of street lighting has been superseded in many places by the adoption of stringent regulations for street darkening. Many other instances of a similar kind might be cited, but in two directions at least the war has produced a stimulus to municipal enterprise. The first is that in many industrial centres the manufacture of ammunition, equipment, and various necessary supplies for the War Office and the Admiralty has resulted in a marked increase in the output of electricity for motive power, and the second that particularly in the metropolis, the commandeering of large numbers of motor-omnibuses for service at the Front has enabled the trams more successfully to meet their great competitor for public favour. Although the past year has not witnessed the appearance of any official publication on sewage disposal of such first-rate importance as the final report of the Royal Commission, the issue of the final and complete report of the Metropolitan Sewerage Commission of New York is worthy of note. The outstanding event of the year in the sphere of highway construction and maintenance was undoubtedly the Roads Congress held in connection with the annual meeting of the Institution of Municipal and County Engineers at Cheltenham, and our contributor on this subject reviews shortly the principal papers presented on that occasion. In the realm of practical experiment with materials some progress has been made, and the behaviour of the trial lengths of concrete road which have been laid in Kent on the main road from London to Dover will be watched with special interest. Each of the four sections is reinforced in a distinctive manner, and the result of the trial will afford a most useful comparison of the several systems. The next branch of municipal work which claims attention is that of water supply. And here there is an interesting tendency to note, inasmuch as the more general recognition of the efficiency of methods of purification is leading to a resumption of the practice of using the source of supply nearest at hand rather than incur the expense of the long pipe lines and other works necessary to procure a supply of exceptional purity from a distance. The science of water treatment is still in the stage of rapid development, but the period of absolute safety by the adoption of economical new methods has unquestionably arrived. Reference must here be made to the beneficial effects of water purification on the health of our armies both at home and in the field. The comparative immunity from the scourge of enteric is due to the fact that the authorities were able to procure at short notice plant capable of treating the worst water, and rendering it not only safe for drinking purposes, but of the best possible quality. In architectural and building work, chief activity has again been manifested in regard to the housing of the working classes, the largest scheme being that by which the Government propose to erect some eight thousand houses at Rosyth. Many public elementary schools have also been erected, the regulations of the Board of Education having been revised. Several large schemes for the provision of sanatoria and hospitals have been undertaken, the most notable being that by which it is proposed to construct a new infirmary at Bradford at a cost of £200,000. New guidance in the design of these institutions was afforded by the important memorandum on the subject issued by the Local Government Board. In the tramway world the work of the past year has once again demonstrated that there is as yet no justification for the suggestion that municipal trams are destined to be superseded by the self-contained motor vehicle. Even in the metropolis, where the conditions are unique, the severity of the competition of the motor omnibus is due in no small measure to the handicap of the statutory burdens imposed upon the tramways, while the excessive capital cost of the conduit system is another large factor in the situation. In provincial towns the profits have, in many cases, been remarkable, and considerable relief to the rates has resulted. The popularity of the railless trolley car has continued, extensions having been carried out in no fewer than five important towns, while new schemes have been adopted in other places. Apart from the restrictions which have latterly been imposed in regard to street lighting, the most remarkable event of the year in this department was the

appearance of the new half-watt lamp, which was put on the market in January. This is well adapted to replace the arc-light, and is already in use in many places. There are two points to be noted in regard to refuse disposal. One is the suggestion emanating from the Westminster City Council for a conference of all the metropolitan authorities to consider the advisability of taking some joint action in the matter; and the other is the increasing tendency to utilise the products of destruction for road-making, among the authorities who have installed machines for reducing clinker for this purpose being the corporations of Liverpool and Hornsey. In bridge construction further progress has been made in the use of reinforced concrete. Among the bridges for which this material has been used mention may be made of Wood Bridge at Guildford, and the new Longford canal bridge over the Bridgewater Canal, on the Chester main road at Stretford. The last matter which claims our attention is the supply of electricity. Here we find a rapid growth in the use of current for domestic purposes other than lighting—a particularly gratifying feature, inasmuch as it means an increased output for the same maximum load. The enormous scheme embodied in the bill being promoted by the London County Council bids fair to dominate the electrical situation for some time to come, and its progress will be watched with the keenest interest. Such, then, are the main features of the work of the most remarkable year in living memory. No one can tell what is hidden in the womb of the future, but municipal engineers as a body remain determined to discharge whatever duties may fall to their lot in the interests both of their localities and the nation.

BRIDGES.

Events during the latter part of the past year have probably caused more thought to be given to the destruction of bridges than to their construction; but, although this country has happily up to the present largely escaped the destructive efforts of our enemies, the mere possibility of a German invasion makes the construction and maintenance of our bridges a matter of vital military and national importance. The widespread destruction of bridges in Belgium, France and Poland is bound to make great demands in the near future on the energy and skill of the engineers of these countries, and it is very probable that not only will English money be required to build them, but that English engineers may be called upon to design, and English contractors to construct, many of the bridges destroyed or damaged on the Continent. Apart from the war and the possibility of having to transport heavy ordnance and other war material along our roads, the increasing number and weight of heavy commercial motors now using our roads and bridges makes the strengthening or improving of existing bridges a necessity in nearly all parts of the country. The increased number of vehicles now using our roads has also led to the widening of many existing bridges, and while in a number of cases it has been found possible to widen an existing bridge, it is generally found to be more expedient and economical to construct new bridges of much greater width and strength. The question of the materials to be used for the construction of the bridge is still largely governed by the span, though the weight of the loads to be carried, and the site and cost of materials, are all important factors in deciding this question. Timber, though still largely used in the Colonies and other countries where it is plentiful and other suitable materials are scarce, is rarely used in this country for highway purposes, and is chiefly used for footbridges, or road bridges of a temporary character. Among the timber bridges of a temporary character may be mentioned the footbridge at the Old Southwark Bridge, and those used for military purposes, such as the bridge across the Scheldt, which enabled our Naval Brigade to escape from Antwerp. The ease of transportation, quickness of construction, and the general availability of local supplies, make timber especially useful, whether the roadway of the bridge is laid on pontoons, barrels, or boats, or constructed on piles or trestles.

Masonry and concrete are still the most largely used materials for highway bridges, but in many of the highway bridges designed by our railway engineers brick and steel are still in great favour. Brick arches are very useful for short spans and where the depth of material in the bridge is not of great importance. For spans over 100 ft. masonry concrete, or steel are more reliable and economical. While reinforced concrete may be used for spans between 300 ft. and 100 ft., it has not, up to the present, been found advisable to use those materials for greater spans. The longest existing bridge in these materials is the reinforced concrete bridge at Langweis, Switzerland, with a span roughly of 330 ft.; but the Americans, as usual, are going to "lick creation" with a span of 703 ft. in the proposed Spuyten-Duyvil Creek Bridge at New York. For the largest spans steel is still without a competitor; and while simple trusses can be used up to 700 ft., it is more economical and advisable to adopt the cantilever principle for spans above this length. The cantilever system has generally been adopted for the largest span bridges, such as the Forth Bridge and the new Quebec Bridge over the St. Lawrence River. The site of the bridge cannot always be fixed from purely engineering considerations, as the saving of time and haulage by giving a more direct route may frequently lead to the selection of a more expensive site. Physical considerations again largely influence the design, such as the difficulty of obtaining satisfactory foundations, the avoidance of steep approach roads, the area of the waterway required for floods, and the headway necessary in the case of navigable rivers or canals.

For spans up to 300 ft., which may be said to meet the majority of the cases the municipal engineer has to deal with, there is a growing tendency to prefer reinforced concrete to masonry or steel. The saving in first cost over stone, and the saving in maintenance over steel, accounts for the selection of concrete in most cases; but the flatter arches that can be adopted, and in the case of small spans of the beam and slab type the absence of steep gradients in the bridge approaches, and consequent saving in embankments, make concrete not only convenient and economical, but also a growing and formidable competitor of stone.

BRIDGE ARCHES.

Stone, however, is still preferred by many engineers, and for nearly all the more important bridges of a monumental character stone is the material used for the arches, spandrils and balustrades, though concrete is generally used for backing to arches, spandrils, piers and abutments.

The objection to concrete for facing is its want of colour and texture, and the unsightly surface cracks which appear to develop in nearly all concrete structures. Added to this drabness and disagreement is the fact that neither architects nor engineers have yet solved the problem of treating this material in an artistic or pleasing manner. This is especially so in the case of the majority of bridges where reinforced concrete has been used, for many of them are so bald and ugly that they have brought the materials into great disfavour with many engineers and architects.

It is not too much to say that the average reinforced concrete bridge has, up to the present, been designed on such strictly utilitarian and economical lines that its bareness and want of enrichment in the shape of architectural mouldings has prevented those engineers and architects who still prefer taste to economy from adopting it in their bridges and buildings.

A case in point may be quoted in the widening of a bridge on the borders of the counties of Derby and Stafford, where a scheme for a ferro-concrete bridge, at a cost of £2,000 was abandoned in favour of a stone bridge to cost £5,000 mainly on account of the desire to preserve the artistic character of the old bridge.

Reinforced concrete can never have the massive grandeur of stone, for the lines on which it can be used economically do not permit of the boldness or depth of mouldings to be obtained in stone. It is probable that stone will always be preferred for monumental bridges, but there is abundant evidence that both engineers and architects, while more fully recognising the limitations of reinforced concrete, are beginning to develop more suitable methods of treatment, and are designing on more artistic and pleasing lines. Closely connected with this question of design and the aesthetic treatment of bridges is the question of who shall be responsible for the design of our bridges—the engineer or the architect.

The architectural profession claim that no structure of an ornamental character should be left in their hands, or, at any rate, should always be designed by an architect. Whenever a bridge has been successfully designed by an engineer in the past it has been amusing to see him claimed as an 'architect, as is the case with Rennie, the engineer of London Bridge. This bridge is admittedly one of the most satisfactory bridges from an artistic point of view in this or any other country. On the other hand, we do not find engineers claiming Wren as an engineer because he tackled successfully many engineering problems, including town planning and road design.

It is true that in France the engineer and architect frequently collaborate in the design of bridges, and occasionally, as in the case of the Pont Alexandre III. at Paris, with success; but opposed to this we find that the architectural press of this country is agreed that the attempt to give architectural expression to the Tower Bridge by allowing an architect to clothe Sir John Wolfe Barry's engineering design is not a success. The designs for giving an architectural character to the proposed St. Paul's Bridge, submitted in the competition held for this purpose in May last, cannot be said greatly to support the plea for handing over the design of our bridges to the architectural profession. In the first premiated design by Mr. G. Washington Browne, R.S.A., there is nothing of an architectural character in the bridge itself which the engineers, Messrs. Basil Mott & F. Sumner, could not have been expected to design equally satisfactorily. The principal features of Mr. Browne's design are the pylons and staircase at the south end of the bridge, and these chiefly owe their artistic character to the statuary to be placed in the centre of the stairway. The obelisks at the head and foot of the stairway are dwarfed by the pylons, and are unsatisfactory in scale and character.

The trouble appears to be that both the engineer and architect have the defects of their virtues, and while the engineer is generally too practical and restrained in his design, the architect goes to the other extreme and overloads his design with too elaborate, and frequently unmeaning, ornament.

In connection with this bridge it is interesting again to notice the different opinions with regard to covering the footways. Sir Aston Webb, in discussing a design by Mr. T. Raffles Davison for the proposed new bridge across the Thames at Charing Cross, said "he was disappointed that it did not show covered ways to the bridge. It was brutal to expect people to cross uncovered bridges on a pouring wet day. Southwark, St. Paul's, and Lambeth Bridges were all about to be built, and if we did not get protection on these bridges we should never get it at all." On the other hand, Sir Wm. Emerson, another past-president of the Royal Institute of British Architects, who was the assessor in the St. Paul's Bridge competition, may be said to disagree with this view, seeing that he awarded the first design to a scheme showing footways without covering. The covered footways certainly give the design less restraint and dignity, but their utility would be unquestionable. It is difficult to reconcile the objections of many architects to these features with their obvious penchant for ornament in the way of pylons and obelisks, which, whatever use they may have in some cases as giving weight to the abutments of bridges, are in the main, if not altogether, in the architectural mind introduced as an artistic or monumental feature. The chief fear in the minds of many people is that the covered footway may lead to the introduction of shops on our bridges like those on Old London Bridge, and so interfere with the view of the Thames or other rivers. There does not seem to be any great weight in the objection to covered footways, for the height required for headroom need not be so much greater that it would interfere with the view or be out of scale with the bridge or river. By keeping the cornice somewhat higher the artistic value need not be diminished, and in many cases the greater depth from the cornice to the crown would not only be an advantage structurally, but artistically. The simple fact remains that the bridges which are most admired are those in which the simplicity and severity of classical architecture is adopted, and in which the lines and design closely follow the structural necessities.

With the introduction of the covered footways on the bridge, we may soon follow with the covered footway or verandah on all our main streets, as foreshadowed by Bellamy in his "Looking Backward"; or as seen in colonnades such as the Rue de Rivoli in Paris, or the "Rows" in Chester.

BRIDGES AT BIRMINGHAM.

A paper on "Recent Highway Bridges in Birmingham," read by Mr. A. S. Parsons, ASSOC.M. INST.C.E., at a meeting of the Institution of Municipal and County Engineers, and reported in THE SURVEYOR of May 29, 1914, described four bridges which had been recently constructed in that city. The first bridge replaced a structure erected in 1842 which spanned both the river Rea and the Birmingham and Warwick Canal. The old bridge was composed of three brick arches, two each of 28-ft. span and one of 32 ft., with a width of roadway of 15 ft. between parapets. The new bridge has two spans of 41 ft. and 39 ft., the width of the roadway between the parapets being 42 ft. The brick parapets are carried on built-up steel girders, and two main girders are placed near the kerb to carry the trough flooring for the carriageway. This is a well-known type of bridge, and the most interesting features are the provision made under the footways for carrying the gas and water mains and the electrical cables, and the use of cover plates in the road troughing, which saves a large amount of concrete filling—estimated at 68 per cent of the total weight of flooring—and consequently reduces the stress in the main girders, and makes a corresponding saving in the weight of the girders also.

The description of the reconstruction of a brick arched bridge over the canal at King's road gives many useful details of construction and of the difficulties met with in bridge reconstruction,

which, owing to traffic necessities, is carried out in a very limited time. The gradient of the approach roads on the north side of the bridge averages 1 in 17, and the maximum gradient is 1 in 12·5, and this appears to be a case where the use of a reinforced concrete bridge could have been adopted with advantage. Although no details are given of the length of the approach road, it is probable that the greater depth required by the brick arches might have been saved by the use of reinforced concrete, and so have led to an improvement in the gradients of the approaches to the bridge.

Two other brick arch double-span bridges over the river Cole are described, and, besides giving very useful plans, sections and notes with regard to the methods adopted during the construction, the paper contains much valuable information regarding materials and the cost of construction, the methods of design, calculation of stresses and pressures, and the setting out of the work.

A MIDDLESEX BRIDGE.

A somewhat similar type of bridge to those at Birmingham is the bridge described in our issue of October 2, 1914. This carries the main Bath road over the river Crane in the county of Middlesex, and was designed by the county engineer, Mr. H. T. Wakelam, M.INST.C.E. The old three-arched bridge, with a width of 21 ft., which was built about 1780, is to be replaced by a two-arched bridge with a width between parapets of 50 ft The awkward lines of the road are to be improved, and the gradients of the approaches made 1 in 45. The arches have 26 ft. clear span, and are formed by four half-brick rings of blue brick, with 8 to 1 concrete filling over the arches and piers, and the piers and spandrels have stone dressings with a stone balustrade parapet.

PENWORTHAM BRIDGE.

A very much needed improvement is now being carried out by the Lancashire County Council from the designs of the county bridgemaster, Mr. W. Compton Hall, M.INST.C.E., by the construction of a new bridge over the river Ribble near the old Penwortham bridge at Preston. The old bridge had become unfit to carry modern traffic, was very narrow, made an awkward and dangerous angle on the main road from Preston to Liverpool, and the approaches were very steep. The new bridge gives a direct route from the town to the Liverpool main road, shortening the distance by over ½ mile, has easy approaches, and has only three spans instead of the five spans on the old bridge. The bridge is built in masonry, the three arches each have 90-ft. span, and the width between the parapets is 60 ft. The estimated cost of the bridge is £38,000, and it will be completed in the course of a few weeks.

REINFORCED CONCRETE BRIDGES.

Wood Bridge, Guildford.—The reinforced concrete bridge which, under the direction of Mr. A. Dryland, ASSOC.M.INST.C.E., the county surveyor of Surrey, was erected at Guildford in the place of a masonry bridge which had become inadequate for the traffic, was briefly referred to in our last Annual Issue, but a fuller description, with detail drawings of the bridge, was given in THE SURVEYOR of June, 1914. The clear span between the abutments is 70 ft., with a width of 40 ft. between the parapets. The bridge was designed to carry a test load of three 20-ton traction engines in train travelling over the bridge, in addition to the dead load. The train was placed in a position which caused a maximum bending moment on the span, and a uniformly distributed load was calculated which would produce an equal bending moment. This uniform load worked out at 200 lb. per square foot, which is the load per square foot for main road bridges recommended by various authorities on arched-bridge design. When tested with a deflectometer, the deflection was practically unmeasurable, being only $\frac{1}{32}$ in., or $\frac{1}{1008}$ part of the span, although the deflection allowed under the specification was $\frac{1}{1000}$ part of the span, or 1·4 in. The bridge is constructed with arch ribs at 5-ft. centres supporting the decking slab, one rib under each parapet, and two ribs being placed close together in the centre, allowing one-half of the bridge to be constructed at a time, and so avoiding the necessity of diverting the traffic. In order to provide satisfactory foundations for the abutments it was necessary to pile the ground with 12-in. by 12-in. "Kahn" piles, 22 ft. long, six to each buttress. Where the old foundations interfered with the driving of the piles a thick, heavily reinforced slab was put in between the rib buttresses over the existing foundations. The fronts of the buttresses are connected by a reinforced concrete wall, which forms a retaining wall for the earth filling over the abutments.

Longford Canal Bridge.—The new Longford canal bridge over the Bridgewater Canal, on the Chester main road at Stretford, is a reinforced concrete structure which replaces an old stone bridge dating from the time of the construction of the Bridgewater Canal. The old bridge, which had been twice widened to accommodate the increased traffic, was of a "bottle-neck" character, which had caused many accidents, and by making the new bridge the full width of Chester-road a much-needed improvement has been carried out. Whereas it was necessary on the old bridge to have interlacing tramway lines, the new bridge has a double track, and provides a greater space for the very heavy traffic of the district. The new structure is of reinforced concrete on the British Reinforced Concrete Engineering Company's system, with ashlar parapets and piers. It was constructed in two halves, so as not to interfere with the tramway and other traffic passing over the bridge. The width of the new bridge is 50 ft., with a carriageway of 35 ft., and two footpaths each 7 ft. 6 in. wide. The span on the skew is 36 ft. 9 in., covering a square span over the canal and towing-path of 34 ft. The roadway has been widened 16 ft. and the canal 10 ft., and the cost of the work is about £3,500.

Pont Ebbw Bridge.—A new ferro-concrete bridge, which replaced an old masonry bridge over the river Ebbw, some 2½ miles from Newport on the main road to Cardiff, is described in THE SURVEYOR of August 21st. The old bridge was very narrow, being only 18 ft. 3 in. between the parapets, with very awkward turnings at each end of the bridge.

By abolishing the bends at the ends of the bridge and widening it between the parapets to 40ft., the new bridge gives greatly improved traffic facilities.

The design of the new bridge follows very closely that of the old bridge, and has three spans, the two end spans being each 32 ft. 9 in., and the centre span 38 ft. 6 in. The old masonry abutments and piers are utilised for a portion of the bridge, the new portion being carried by ordinary concrete abutments and river piers. All three arches are of the monolithic type, securely fixed at the springings, and enclosing the old brick arches. The arches are 12 in. thick at the springing and 6 in. thick at the crown, and earth filling is deposited on the arches to the level of the roadway. The spandrel walls and parapets are in ferro-concrete.

Longtown Bridge, Cumberland.—A fully illustrated description will be found in our issue of October 16, 1914, of a new ferro-concrete bridge at Longtown, which is now being constructed to take the place of the interesting old cast-iron bridge built from the design of Thomas Telford in

1820, which had become unable to carry most of the traffic.

[illegible] designs, with estimates prepared by Mr. W. Scott Finch, the county surveyor, were submitted for masonry, steel girder, and ferro-concrete bridges, and as a result the latter materials design on the Hennebique system was adopted.

The bridge only 24 ft. wide between the parapet walls, is of considerable length, consisting of 3 three-arch spans with two short girder spans on the north approach. The central arch span is 105 ft. clear span, the two flanking spans being each 68 ft. 6 in. clear span, and the rise in the arch is about 8 ft. in each case. The bridge is of the three-arch rib type, with spandrel columns supporting longitudinal main beams, which in turn support the secondary beams and connecting decking, the whole being in monolithic connection. The abutments are L-shaped, and are constructed, consisting of vertical wall and flanking, each 3 ft. 6 in. thick, the shorter being 40 ft. and 45 ft. long, and connected to the vertical wall by three concrete counterforts, which take the thrust of the arch ribs. The middle counterfort is 5 ft. thick, and those on either side 4 ft. thick.

The full width of the abutment floors is 31 ft., the bearing area having been calculated for a pressure not exceeding 4 tons per square foot. The abutments are filled in with earth to the road level. The river piers have concrete foundations [illegible] resting on rock, 24 ft. wide and 40 ft. long in the direction of the stream. The [illegible] of the bases are maintained to a height of 3 ft. above the rock, and then taper to a pier width of 10 ft. The decking is 9 in. thick with a 9 in. depth of road material at the crown, and the balustrade is 4 in. thick.

It is an interesting piece of work, and, though of the usual severely plain type, its lines are such that it will not be inartistic or unsuitable for the situation in which it is constructed.

Warrington Bridge.—Among other reinforced concrete bridges which have been completed this year, the Warrington Bridge may be mentioned. The first half of the bridge was opened in July, 1913, to the long [illegible] was described in our last Annual Issue. The recent death of Mr. J. J. Webster, M.INST.C.E., the engineer for this and many other important bridges, may be noted.

Langweis Bridge.—A very interesting reinforced concrete viaduct, described in the April issue of *Concrete*, is being constructed near the village of Langweis, Switzerland. The viaduct carries an electric railway across the valley of Plessur and Sapenerbach, and has a main arch of 96 metres clear span between the abutments, or 100 metres span from centre to centre of springers, with a rise from the springer of 42 metres. On both sides of the main arch are a series of four smaller openings of 14·7 metres clear span. Three more spans beyond the abutments were afterwards added instead of an earth embankment as first proposed. The central arch comprises two separate arch rings, which are held together by means of rigid cross-beams. The width of the roadway between parapets is 4 metres.

Goombee Bridge.—A ferro-concrete arched bridge over the Goombee River at Lucknow was opened last year by the Viceroy of India, replacing an old bridge built in 1780. It consisted of five spans of 75 ft., the piers having 8 ft. centres. Each pier rests on three circular cylinders, carried down to the hard clay 33 ft. below the river bed. The width of the roadway is 22 ft., with 6-ft. footpaths on each side. The arches were originally to have been constructed in brickwork, but this was afterwards changed to reinforced concrete with seven concrete ribs to each span. The superstructure above the arches is in brick work, with red sandstone facings.

[illegible]

Of the large [illegible] bridges under construction or were opened this year, the new Quebec Bridge over the St. Lawrence River, the Lansdowne Bridge at Sukkur, the Scherzer Bridge over the Pamban Channel, between India and Ceylon, and the Manhattan and Hell Gate bridges at New York, may be mentioned.

Quebec Bridge.—The new Quebec Bridge, now in course of construction is of the cantilever type, and provides for four lines of railway and two footways, and has an extreme width [illegible] 2,590 ft. long between the faces of the abutments. The main span is to be 1,800 ft. between the centres of bearing, the anchor arms being 515 ft. long, the cantilever arms 580 ft. long, and the central suspended span will measure 640 ft. It has one approach span 140 ft. long at the south end, and [illegible] a land [illegible] 390 ft. long at the north end. The width of the bridge is 88 ft., and the [illegible] 150 ft. The type [illegible] is unsuitable [illegible] 4 [illegible] is [illegible]. It [illegible] minimum of advantages [illegible] bridge, especially during construction, the chief being that during erection of the cantilever span it is possible to complete each panel by itself and move the travelling [illegible] end of the completed portion. The bridge is to take on each track two [illegible] followed by a train load of 5,000 lb. per lineal foot of track. In addition to the actual dead weight of the structure, a load of 500 lb. per foot run was provided for on the suspended span, and of 800 lb. per foot run on the remainder of the bridge as an allowance for the winter snows. The bridge will [illegible] 87 tons per foot near the centre and [illegible] tons per foot near the piers, the corresponding [illegible] the Forth Bridge being 2 and 13½ tons.

Sara Ghat Bridge.—The bridge over the river [illegible] at Sara Ghat, about 120 miles above Calcutta, will carry the main line of the Eastern Bengal State Railway, and ranks as one of the most costly engineering schemes in India and the Far East. The estimated cost of the bridge and approaches is over £3,000,000. It is a double-line bridge capable of carrying the heaviest future loads, has a headway of 40 ft., and provides a public footway. The river has erodible banks, and at each abutment of the bridge are two guide [illegible] the first [illegible] are each 1,000 ft. long. The bridge has [illegible] each 1,315 ft., centre to centre of bearings, on piers spaced 359 ft. apart, and at each end [illegible] are three spans of 75 ft. The main girders are of the "N" type, with sub-panels, with a depth of 52 ft. at the centre. The width of the bridge, including the footway, is 48 ft. 6 in. The sixteen main piers are carried on wells sunk to a depth of 150 ft. to 160 ft. below lowest water-level, and are probably the deepest foundations of their kind in the world. It is hoped to complete the work and open the [illegible] during the present year.

Pamban Scherzer Bridge.—The Scherzer Bridge over the Pamban Channel, which has been completed this year, affords a means of communication between India and Ceylon. The viaduct from Pamban Point to Pamban is 6,776 ft. long, and a Scherzer bridge is constructed across the Pamban Channel, the channel being deep enough to allow of the passage of vessels of light draught. The viaduct has 145 openings of about 40-ft. span. The opening bridge is a double leaf through Scherzer rolling lift bridge, 225 ft. long and 16 ft. wide. At each end of the bridge is a fixed structure carried on steel cylinders. The leaves are raised and lowered by hand, but provision is made to work them electrically if required. The bridge was opened in February, 1914, and

reduces the length of the sea voyage from Colombo to Tuticorin from 150 to 22 miles.

Manhattan Bridge.—The Manhattan Bridge, connecting Manhattan Island and Greater New York, which is described at some length in the *Engineer* of September 25th and following issues, carries eight lines of railway track, two promenades, and a 35-ft. roadway, and is being completed at a cost of 25,000,000 dollars. It is 6,855 ft. long over all, including 2,505 ft. of steel approach viaducts, and is 2,920 ft. long between anchorages. The suspended spans are 725 ft., 1,470 ft., and 725 ft. respectively. They have a maximum clearance of 135 ft. above high-water, and are 120 ft. wide over all. They have four lines of stiffening trusses 24 ft. deep, suspended from cables 21½ in. in diameter and about 223 ft. long, supported on steel towers at a height of 315 ft. above high water. The eight railway tracks are at two different levels, one being over the other. This bridge has been constructed under several municipal administrations, and the dimensions and type of the structure have been from time to time radically modified. The system was originally designed as a wire cable structure, then changed to one with eyebar cables, and finally restored to the wire-cable system. Several engineers have been successively responsible for the work, and two well-known architects have been responsible for the architectural features of the substructure.

Hell Gate Bridge.—A bridge, which is said to be the largest steel arch bridge in the world, is being constructed at Hell Gate, over the East River in New York, between Long's Island and Ward's Island. It will form part of the New York Connecting Railroad, and carry four lines of railway. It is a two-hinged, framed arch structure of 1,017 ft. span between the towers at each end, 977½ ft. span centre to centre of hinges, and 280 ft. rise from hinges to crown of the lower chord. The roadway will consist of a reinforced concrete trough, filled with ballast, in which the sleepers will be embedded. The main stringers of the floor carry 8 in. transverse I beams, 15 in. apart, and between and on the top of these the reinforced concrete slab of the track trough is built. Each track will have its independent trough. Huge towers, built of reinforced concrete and faced with granite, are to be built at each end of the bridge, which not only give the essential stability to the bridge, and form ornamental portals and terminal, but will be used in erecting the structure.

OTHER STEEL BRIDGES.

Three other steel railway bridges now being completed, to which brief reference may be made, are the bridge over the Rio Chico, on the Mexican National Railway, the bridge at Riga, and the Great Western Railway bridge at Westbourne Terrace. The Rio Chico Bridge is a single-track cantilever bridge, having anchor arms of 105 ft., cantilever arms of 135 ft., and suspended span of 120 ft., with three-deck girder spans to the approaches, making a total length of 701 ft. 6 in. The Riga Bridge is 770 metres long, and has ten steel arches, the longest span being 90 metres. There is one opening spanned by a 40 metre bascule bridge, operated electrically. The new bridge at Westbourne Terrace has a span of 244 ft.

ELECTRICITY SUPPLY.

In spite of the cataclysmic convulsion which has distinguished the past year from all other years, the course of electricity supply in this country has not departed greatly from the normal. The year began with favourable prospects, and a number of interesting movements in process of development, and many of these have been duly advanced towards fruition. The supply of electricity is progressing apace, its applications are multiplying, and even a world-wide war cannot retard its development. The most serious effect of the war upon municipal supply stations perhaps has been the depletion of the staffs, many members of all grades having been called up to the Colours as Reservists or Territorials, and many more having volunteered for the new Army. But this movement has not been permitted to go too far, the importance of maintaining an adequate and reliable supply of electricity being fully realised. In many industrial centres the manufacture of ammunition, equipment, and various necessary supplies for the War Office and the Admiralty has resulted in a marked increase in the output of electricity for motive power, and the Government early took occasion to point out that those who assisted in carrying on these important functions were serving their country just as truly as those who joined the Army.

A minor effect of the war has been the cancelling of certain contracts for new plant which had been placed with German firms and obviously could not be carried out. This has, of course, resulted in the replacing of the orders with British manufacturers; but so many of the latter are engaged upon Government work of an urgent nature that some delay may be experienced in obtaining delivery. Fortunately, the time of heaviest load has been safely passed, and the need of additional plant will be less and less felt until next autumn. Many interesting revelations have occurred in connection with the true sources of certain raw or partly wrought materials used in the electrical industries, and the enforced suppression of some channels of supply has benefited British trade by compelling the development of home sources. It cannot be doubted that after the war the attitude of municipal committees towards the placing of important contracts abroad will be materially modified, and cheapness will cease to be the sole consideration by which they are guided.

DOMESTIC USES OF ELECTRICITY.

Broadly speaking, the most marked feature of the year appears to have been the rapid growth in popularity of electrical cooking and heating; the manufacturers of electric radiators cannot turn out apparatus fast enough to satisfy the demand. As it must be admitted that electric heating, except on a modest scale, is much more costly than heating with coal, and, though to a less extent, than with gas, it is obvious that the popular demand must be attributed to features which weigh more with the users than the cost of energy or fuel alone—namely, to the convenience and portability of the electric radiator, its freedom from fumes, its safety from fire, and so on. Great improvements have been effected in the construction of the apparatus, particularly in connection with the heating elements, which constitute the weak points of all such appliances, and some makers are now able to grant very extended unconditional guarantees, which indicate the confidence they repose in their products. The excellence of a design can only be correctly gauged by the popularity which it attains, and the present demand not only points the way to success, but also will facilitate the rapid trying-out of improvements in detail. The same applies to electric cooking apparatus, which, however, has less to fear from the competition of coal and gas, being well able to compete with the latter on level terms in almost any district where electrical energy is obtainable at not more than one penny per unit for domestic purposes—a condition which is fulfilled in a very large number of towns.

In his recent presidential address before the Institution of Electrical Engineers Sir John Snell stated that a great increase in the output of energy for domestic purposes other than lighting must be expected and provided for, the ratio of "other domestic units to lighting units in some cases which he had investigated being as high as ten to one—an extraordinary result. In his opinion a ratio of five to one would probably be attained in the near future, resulting in a greatly improved output and load factor, and consequently in decreased cost of production. Moreover, a most significant outcome of his exhaustive investigations was the discovery that the addition of heating and cooking to the lighting and power load made no difference to the maximum load upon a generating station. The full importance of this fact will perhaps be appreciated only by electrical engineers; but, briefly, it may be explained that the very large additional output thus foreshadowed could be provided without any additional capital outlay on plant and mains—and it is the heavy capital cost of electrical plant that necessitates a high price per unit for lighting and other loads which occur at the time of heaviest demand. Thus the cooking and heating loads are very welcome to the station manager, who can supply them at a very low price and still make a good profit. The reports of other engineers agree with the statements quoted above, and it was recently stated, for example, that even in such an unprogressive borough as Hackney a cold morning meant an extra load of 2,000 kilowatts, due to the use of electric radiators. In Marylebone, where special efforts have been made to promote the use of electricity for domestic purposes, it was reported some months ago that there were nearly 3,000 radiators, and no fewer than 1,000 electric cookers in use, as well as over 700 electric irons; in two years the heating and cooking connections had increased by 1,700 kilowatts.

THE HALF-WATT LAMP.

An important event in January was the introduction of a metallic-filament lamp of remarkable efficiency, giving two candle-power watts—a result previously unattained except by the most efficient arc lamps. Specimen lamps had been exhibited in London some months previously, but they now came on the market in quantity. As they could not be made for less than 1,000 watts (100 candle-power) at the customary pressure of supply, or 600 candle-power at 50 volts pressure, they were suitable only for illuminating streets or large halls and shops, thus competing with the arc lamp, and were inapplicable to ordinary indoor lighting. This was, however, a fortunate circumstance, for the sudden introduction of a lamp of so high an efficiency and suitable for domestic and similar purposes, would have had highly detrimental effects upon the business of electricity supply—much worse than those experienced when the tungsten lamp was first brought out—although, of course, in the long run the industry would benefit by it.

That the small lamps will eventually come can hardly be doubted, but it is to be hoped that the change will be gradual. The improved efficiency is due to the very high temperature of the filament—so high that the substance of the filament would evaporate too rapidly to permit of a long life if the lamp bulb were completely exhausted, as in the ordinary lamps. Nitrogen gas is therefore admitted into the bulb, at a pressure somewhat below that of the atmosphere, and by its presence checks the evaporation. At the same time, unfortunately, it cools the filament to some extent, and thus prevents the advantage of high temperature from being reaped to the full; but the reduction of consumption from 1¼ watts per candle to ½ watt is, nevertheless, an enormous stride; moreover, the convection currents in the gas carry the slight amount of tungstic oxide that is given off to the cooler upper parts of the bulb, where it is condensed, and thus the glass bulb remains untarnished throughout the life of the lamp, and the full initial candle-power is maintained. The guaranteed life of the ½-watt lamp is 1,000 hours, but in practice it is found that the average life is about 50 per cent. longer. The intense brilliancy of the filament, which is concentrated into a very small volume, renders it necessary to use diffusing globes, and consequently the new lamp was accompanied by a crop of special globes and reflectors; the concentration of the source of light facilitates the design of highly efficient reflectors and prismatic globes, and has led to a very marked improvement in these accessories. The special qualities of the lamp have also rendered it admirably adapted to the system of indirect lighting by reflection from the ceiling and walls, which has thus experienced a great increase in popularity.

[illegible]

The progress of the indirect [illegible] supply is well illustrated by the important projects which have been put in hand by several of the leading municipalities, including the London County Council. All these schemes are characterised by two essential features—recognition of the necessity [illegible] and the adoption of the system of generation and transmission at high pressure, employing three-phase currents, even though the general distribution is effected with direct current. Thus Glasgow, which had developed an enormous direct-current system with several large direct-current generating stations within the city, has found it necessary to commence a large [illegible] station at Dalmarnock, on the Clyde, which will cost half a million sterling; Manchester is preparing to erect a generating station of no less than 160,000 kilowatts capacity at Davyhulme, on the Ship Canal, which will cost £1,200,000; Liverpool is increasing the capacity [illegible] 30,000 kilowatts of three-phase plant—a station which formerly generated direct current; at Hull, where a high pressure direct-current system had been employed very successfully, the three-phase system [illegible] and Birmingham has important extensions in hand. Of these the most interesting is Manchester, as the new station, when completed, will be the largest in this country, and indeed will rank among the half-dozen largest steam-driven stations in the world; [illegible] undertaking. The city corporation supplies electricity to a population of three-quarters of a million, including many adjoining districts, and has at present plant of about 70,000 kilowatts, and 455 miles of mains. The last year's output was 117,000,000 Board of Trade units, and the receipts [illegible], the net supplies being slightly more than this figure. It is not surprising, therefore, that this undertaking led the way in installing generating sets of no less than 15,000 kilowatts each, and intends to use sets of 25,000 kilowatts in the new station. In London, the Metropolitan Borough Councils of Marylebone and Hackney, both of which commenced with direct current plant, have adopted three-phase for recent large extensions, and other examples could be given, showing the rapid development of the industry. Bethnal Green Metropolitan Borough Council has at last, after long years, decided to carry out an electricity supply scheme, and further progress has been made towards linking up the London municipal stations to help one another.

LONDON ELECTRICITY SUPPLY.

The question of the supply of electricity to London is a problem unique in the world, not only on account of the vast area and population served,

but also because of the extreme heterogeneity of the systems of supply at present in use. These compriso some fifty different varieties, in the hands of thirty-nine authorities, involving a capital investment of £21,000,000 sterling; but in "Greater London" there are over seventy systems and seventy authorities—and yet it is universally recognised that for economy, and consequently for cheapness of supply, concentration is essential. The question how to unify the diversity of systems and to substitute order for chaos, while at the same time satisfying the just claims of existing supply authorities, will be seen to be of immense complexity, and the situation is dominated by the fact that the London County Council has the right to purchase the property of the numerous companies supplying within its area in 1931.

In view of this consideration, which renders it absolutely necessary to decide upon the policy of the council before the approach of the purchase date throttles the expansion of the private undertakings, the council obtained an exhaustive report upon the situation from Messrs. Merz & McLellan, which was published in April. The authors recommended that steps should immediately be taken to initiate the gradual standardisation of supply throughout the area on the basis of three-phase transmission and distribution, and that the generating plant should be concentrated on sites down the river. They also advised that a special public authority should be formed by the county council to finance and control the whole undertaking, while the actual commercial management of the business should be confided to an operating body under the control of the former, the various existing organisations being gradually acquired and amalgamated on commercial terms. The scheme amounted practically to a system of co-operation between municipal government and private enterprise, embodying the advantages and avoiding the drawbacks of both, and a Bill on these lines was duly approved by the council for introduction into Parliament this year. The Bill provides for twenty-seven members on the authority, of whom eighteen will represent the county council and the remainder the various county and borough councils concerned. An expenditure of £10,000,000 sterling is contemplated during the next ten years, and provision is made to prevent existing authorised undertakers from extending their systems except with the approval of the authority, so as to ensure that all future extensions shall be available for incorporation in the unified system of supply which would ultimately obtain throughout the area—an area of 1,000 square miles. Opposition to the scheme is offered by many of the borough councils which possess their own undertakings, but whether this is due to irreconcilable hostility or merely to the desire to obtain the best possible terms remains to be demonstrated when the Bill is before the Parliamentary Committee.

The importance of the question to the dwellers in the metropolitan area can hardly be overestimated, and as the applications of electricity continue to multiply and expand it will increase. While leading with London it may be remarked that the county council, as loan authority for the [illegible] has evidenced a growing concern for the financial stability of their electrical undertakings, and has urged them to reduce the periods allowed for the repayment of their loans from sixty-two years to fifteen years or even less. This attitude is due to the rapid obsolescence of electrical generating plant since the introduction of the steam turbine on a large scale, whereby enormous quantities of plant driven by reciprocating engines—the best of their kind when installed, and in most cases still in first-class order—have been scrapped solely on account of age. Of this the most instructive example perhaps is the county council's own tramway generating station at Greenwich, where the huge engine-driven sets are being replaced by turbo-alternators. The advice of the county council has evoked strong protests from the borough councils, but there can be no doubt as to its wisdom; practice changes so quickly in electrical engineering, due to the continual progress in the science, that a loan of forty-two years' duration for generating plant is (and always was) an obvious absurdity. The Local Government Board never fell into this error.

Provincial Items.

Once more we have to note the increasing use of overhead wires for the supply of rural districts, where the cost of underground mains is prohibitive; not only private companies, but also very many local authorities, are adopting them, and it is clear that the popular prejudice against them is dying out. By no other means can the advantages of electricity supply be brought to the doors of residents in villages and small scattered townships.

While no large undertaking was launched during the year, in several instances transfers of powers took place between municipalities and companies, in both directions. A notable feature was the movement on the part of a number of gas companies to take up the supply of electricity—surely a significant sign of the times. The water-power plant started by Chester City Council last year has proved very successful, and a water-power scheme has been adopted by Knaresborough Urban District Council. Hove Corporation decided to purchase the local company's undertaking for £175,000.

The Ljungström steam turbine—a very remarkable invention—has been installed in several municipal stations during the year, the largest being one of 5,000 kilowatts at the St. Pancras Council's electricity works.

The lighting of small property at cheap rates is occupying more attention nowadays, and noteworthy results have been obtained at Wednesbury and Wimbledon, the principle being to supply a large block of cottages from one service, with the simplest wiring and fittings, and to charge a fixed sum per week per lamp. There is no doubt that a great deal can be done in this way to bring the electric light into the working-man's cottage, and to secure a substantial profit from this class of business. The system of charging ordinary consumers a fixed percentage on their assessment for rates, plus a charge of, say, ½d. per unit for energy consumed, continues to gain in popularity.

The question of tariffs was raised in an acute form during the year by Long Eaton Gas Company, which levied an action against the urban district council on the ground that the latter had infringed the statutory prohibition against preferential charges. The council had proposed to discriminate in favour of consumers who took both power and lighting from its mains, as compared with those who used electricity for power only, and this was shown to be a breach of the law, with the result that municipalities which had such tariffs in force found it necessary to revise them. Little, if anything, is gained by this militantly aggressive attitude towards the gas suppliers, and it is not a matter for regret that the illegality of the tariff has been demonstrated.

Proceedings of Societies.

An important event was the dissolution of the Industrial Committee of the Institution of Electrical Engineers by the council. Much had been hoped for from the committee's activity, and, in view of the council's decision, the Incorporated Municipal Electrical Association resolved to organise an influential body representative of all sections of the electrical industry to deal with matters of grave importance such as would have been handled by the committee. The Incorporated Municipal

Electrical Association for some time has been growing in influence and prestige, though not in membership, and this move, if successful, will further strengthen its position in relation to the electrical industry of this country.

In March the Incorporated Municipal Electrical Association published the draft of a Bill which it proposed to introduce into Parliament, for the purpose of conferring additional and very necessary powers upon municipal electricity suppliers. The contents in the main resembled those of previous Bills drawn up with the same object, but these had always been defeated by the opposition of the wiring contractors, who are bitterly opposed to the clauses which empower the municipalities to sell or hire out apparatus and to wire buildings. The new Bill was framed with a view to disarming this opposition by imposing restrictions on the competition feared by the contractors, and forbidding the suppliers to wire private property except through the agency of contractors. Without going into the details of the Bill, we may say that it offered a very fair compromise, which certainly ought to have been accepted by the contractors; but, unfortunately, they rejected the olive branch, and the matter will apparently have to be fought out as usual. However, the necessity of freeing the hands of the suppliers has become so pressing, and the terms proposed are so reasonable, that we think it likely that this time the municipalities will be successful. As a matter of fact, many authorities already possess some of the powers now sought for all, and there is no doubt that Parliament is not opposed to them on principle.

The Association of Electrical Station Engineers, which was formed in 1913, has rapidly gathered strength and influence, and was very active during the past year. It is composed of the junior members of station staffs, who are notoriously underpaid, and its objects are to improve their status and remuneration, without resorting to the methods of trade unions. At times, however, the association has shown symptoms of the influence of a considerable trade union element within its ranks, and its future proceedings will be watched by station managers not without concern. The possibilities of a strike of station staffs were fully demonstrated in Paris some years ago, and with the growth of electricity supply the matter is becoming increasingly important.

HIGHWAYS.

Though no International Road Congress was held during the past year, there were several smaller congresses, conferences, and meetings held at which many interesting papers on highway subjects were read and discussed. The most important of these was the Roads Congress held by the Institution of Municipal and County Engineers at their annual meeting at Cheltenham. The papers did not cover such a wide range of subjects as those at the International Congress, but they were, on the whole, more useful and practical. The discussions also were fuller and more interesting than those of the larger congress, at which so much time was spent in interpreting the speeches of the various delegates. At the London congress many of the delegates treated their subjects in a very academic manner, but as one would naturally expect, the papers and discussions at Cheltenham were eminently practical.

The next International Road Congress was to have been held in Munich this year, and an interesting programme had been drawn up. His Kaiser has, however, made other arrangements, and though many road engineers may still visit Munich this year, it is not as road experts. They, as victors in the existing war, may be interested that they hope to visit this interesting town.

Had it not also been for the interference of the war, much useful information would have been collected with regard to the classification of roads throughout the whole of the country. The abnormal state of affairs in which the country found itself involved last August rendered the census of traffic arranged to be taken during that month of little or no service, and though many surveyors had started to take the census, it was generally abandoned throughout the country. Classification is certainly necessary before the proposed Government grants can be distributed equitably, and as a preliminary to classification a census of traffic is not only desirable, but also a necessity. In connection with this classification of roads some important suggestions were made in a memorandum drawn up by the Highways Committee of the County Councils Association. Briefly, this recommended that all boroughs or urban districts with populations over 10,000 should be responsible for all first-class roads within their areas, and that all other first-class roads should be vested in the county councils as first-class county roads. Half the cost of maintenance should be paid by the Exchequer and half by the county councils.

All second class roads should be vested in the borough or urban district councils, except any second class roads which are main roads before the passing of the Act, of which the county councils were to be allowed to retain control. The cost of maintenance was to be borne in the following proportions: One-quarter by the Exchequer, one-quarter by the county council, and one-half by the borough or district council.

Third-class roads were to be widely controlled and maintained by the borough or district councils, except any third class roads which were main roads before the passing of the Act, when the control and maintenance would fall on the county council.

There can be no doubt that if these suggestions are adopted a great relief will be given to local burdens, and a great improvement may be looked for in the roads throughout the country.

The Fourth Annual Report of the Road Board, a short summary of which appeared in THE SURVEYOR, July 24, 1914, gives an interesting account of the work of the board in the various countries of the United Kingdom. The policy of the board with regard to grants and loans is clearly defined, and the allocation of the grants and loans to England and Wales, Scotland, and Ireland, is given in tables, which also show the nature of the improvements on which the grant or loan is to be spent. As is to be expected, the bulk of the money goes for the improvement and strengthening of road crusts, but road widenings, improvement of curves, gradients, and corners, diversion of roads, and reconstruction and improvement of bridges all receive the attention and assistance of the board. It is recognised by the board that more money is required for widening many of our main roads, but the greater need for making the existing roads fit to carry the increasing motor traffic compels the board to defer for a time assistance towards widening. The necessity of settling in advance the works intended for periods of trade depression, and that they should be works providing the maximum employment of labour, is also pointed out by the board.

HIGHWAY EXPERIMENTS.

Several interesting experiments in connection with highways have been carried out during the past year, the most important, perhaps, being those carried out by the Scottish district of the Institution of Municipal and County Engineers.

and those recently commenced by the county surveyor of Kent. While no highway engineer can afford to ignore laboratory experiments, the results of such experiments, put forward as they often are so dogmatically, are so frequently contrary to his practical experience, that he looks with a certain amount of scepticism on all such results. The important factors of weather, subsoil, and the wide range of loads and wheel diameters, which can hardly be reproduced artificially, have so great a bearing on the life of the road that most laboratory experiments fail to convince the road engineer of their utility, though they frequently excite his admiration by their ingenuity. In addition to this, the scientifically inclined mind is apt to regard as a great discovery certain actions or characteristics which are the common knowledge of most highway surveyors.

With regard to the experiments in the Scottish and Kent districts such objections cannot apply, as they are being carried out under the conditions of ordinary traffic, and are subject to all the climatic and traffic drawbacks of every-day life. In the Scottish trials, of which lengthy notes and extracts from a memorandum prepared by Messrs. J. Walker Smith and David Ronald are given in THE SURVEYOR of January 9, 1914, special care is being taken to put down the experimental lengths of road crusts in localities where the traffic is fairly comparable. Careful records are to be made of the physical and local conditions, the specification and record of methods of construction and materials, and factors tending to destroy the road, such as traffic and meteorological conditions. The records will include measurement of wear and observations of condition of surface, and the factor of cost, both initial and maintenance. The experimental lengths of roadway, eight in number, are chosen as far as possible with similar widths, gradients, soil, materials, and methods of construction and traffic; and on a continuous length without cross or junction roads, open and free from overhanging trees. The materials suggested are ordinary macadam, tar-painted macadam, and various forms of tar-macadam, though other forms of construction are not desired to be excluded so long as the cost does not exceed 2s. 6d. per square yard. Very careful specifications are drafted for each length, and full instructions are given with regard to the testing, traffic census, recording meteorological observations, wear, conditions of surface, and costs. The results of the experiments will be looked forward to with great interest, as they promise to be exceedingly valuable.

CONCRETE ROADS.

The experiments now being carried out by Mr. H. T. Chapman, the county surveyor of Kent (see THE SURVEYOR, November 27, 1914), will, in some respects, be even more interesting than the Scottish experiments, for, although concrete roads have been laid down for some years in America, they have only recently been laid in this country, and that only to a very small extent. The Road Board are contributing towards the cost of the four sections of road each 75 yds. long, which are to be laid on the London and Dover road between Gravesend and Strood. The concrete is to be 6 to 1, 6 in. thick, and reinforced by various forms of steel, and the British Portland Cement Manufacturers, Limited, are providing the cement, and several well-known makers of steel reinforcement the steel, free of cost.

Several reinforced concrete roads have been laid in this country, and some have been laid down sufficiently long to show that in many situations they will be successful. Concrete with a thin covering of bitumen, or as a foundation for wood paving, has, of course, been used for roads for very many years; but the new features are the use of reinforcement and the absence of a top coating. The surface of the concrete is either left sufficiently rough to give good foothold, or it is dressed with tar, or dressed with tar and a thin coat of limestone chippings.

It has been claimed for reinforced concrete roads that they can be constructed more cheaply than roads of ordinary macadam with pitched foundation, but this is hardly likely to be the case in many parts of the country, where macadam and pitching may be obtained close at hand. The chief advantage would seem to be the securing of a firm and durable roadway at a reasonable price, which in the case of peat or other weak subsoils could hardly be obtained otherwise without a great depth of materials, and consequently great expense. It would avoid potholes and inequalities of wear if made with first-class materials; but there are concretes and concretes, and with much of the material going under the name there would be trouble. The drawbacks to it are the greater difficulty and expense of cutting through the roadway for drainage or service pipes; the likelihood that the surface will either wear slippery or dusty; or that, in the case of tar painting and dressing with chippings, the surface will require constant renewal. Shock to horses travelling quickly on a hard road, and noise of hoofs, are also likely to be drawbacks.

Other troubles experienced with concrete roads in America have been the trouble from contraction and expansion, which a committee who inquired into this matter found was not due so much to changes of temperature as to changes in moisture condition. They found that concrete swells or shrinks every time it is wet or dried, just like a piece of timber, though, of course, not in the same degree. It was found that the maximum expansion occurs in April, when the road is thoroughly soaked by the winter's rain and snow, and when the temperature is somewhat greater than in winter. With the increase of temperature in summer it begins to shrink, and is shortest in August when thoroughly dry. This shows the importance of a rich, impervious mixture for concrete roadwork, so as to avoid absorption of water and consequent expansion as much as possible. A further recommendation of this committee is that the subgrade of the road on which the concrete is to be laid should be slightly dished, instead of being made flat or crowned. This tends to prevent longitudinal cracking of the road by making the centre thicker and stronger.

A further point dealt with by another committee was the finishing and curing of concrete surfaces. Even in many of our main streets paved with asphalt on a strong bed of concrete, depressions and pockets are to be found. As the concrete cannot have much crossfall without being dangerous, great care will be necessary to obtain an even surface with the proper fall. In the same way uniform and careful mixing of the materials are required to obtain a dense and even surface. An excess of large stones at one point, or an excess of mortar at another, will not wear uniformly, and cannot be made into a uniform surface. To avoid slipperiness, the surface is frequently roughed with a broom, or grooves have been cut in the concrete, especially where a fine and very hard material has been used for surfacing.

An equally important matter is the curing of the exposed surface of the concrete. Too rapid drying of the surface will give a somewhat soft surface, which will work up as dust. The essential thing is to keep the surface wet as long as possible. A mere sprinkling of the surface once a day in summer is not enough, and the surface should be continually watered in hot weather for fourteen days. A good method is to cover the concrete with a layer of sand or earth, and sprinkle it often enough to keep the surface in a moist condition. For the first twenty-four hours many engineers require the concrete to be covered with canvas.

Traffic should be kept off the road for about three weeks, and longer if possible in winter when the concrete sets slowly.

For strengthening road foundations wood-block paved or asphalt roads steel mattress would be likely to play a great part in the near future. The heavy motor trucks in many cases have made the ordinary foundations quite inadequate, and these, especially for cross-way tracks, may with great advantage and economy be reinforced with steel.

TAR MACADAM.

The use of tar-macadam is not only becoming certainly extended in the country, but also on the Continent, in America, India and the Colonies. The interest taken in all that relates to the successful use may be seen in the numerous articles and papers dealing with this subject to be found in our columns. The Scottish experiments are almost wholly confined to experiments with various forms of tar-macadam or pitch grouting, and the majority of the papers read at the Roads Congress at Cheltenham had reference to tar-macadam or some other form of bituminous paving.

Although tar-macadam is now recognised as one of the most useful road materials there are still too many failures with it for highway engineers to use it with the confidence that they desire. Not only is there a difference of opinion with regard to the nature of the binder to be used, but an even greater difference of opinion with regard to what is the best stone or other material required for tar macadam. While one surveyor swears by slag another prefers granite, and a third will only use limestone. That satisfactory roads have been made with tar macadam of granite, slag, and limestone, though with varying degrees of success so far as regards durability, proves that it is the binder which is the chief factor in the success or failure of the finished roadway.

It is generally agreed that tar-macadam of limestone makes a good road for residential streets with light traffic, but for main roads with heavier traffic it is not sufficiently durable, and is apt to become somewhat dirty in summer and quite smooth and slippery. Slag, when carefully selected, and mixed with the care that is exercised by our large manufacturers, has been very generally successful. On the other hand, much slag of a soft, sulphurous and honeycombed nature, has been sold, and has led to many failures. Granite, again, in many parts of the country has been most successfully used for the heaviest trafficked main roads; and probably in almost as many cases has not been a success.

From this we may safely assume that it is not so much the stone as the binder or method of mixing that is at fault. Twenty or thirty years ago it was not uncommon to find tar asphalt footpaths made with ashes, clinker, or pottery; and some of these, where there had been little traffic, when taken up within recent years, were found to be in almost as good a condition as when they were laid. The tar was as alive and viscous as when it was laid, and yet in another length of the same footway, made with the same materials, the tar had perished and the footpath become disintegrated with only a quarter of the life of the other. The care and experience in mixing is, again, a very important factor in the success of tar-macadam.

While makers of tarred slag and limestone have had many years' experience in mixing, granite quarry owners having had almost a monopoly in materials for ordinary macadam have only recently turned their attention to making tar-macadam. Again, a great part of the granite tar-macadam used up to the present has been mixed by surveyors in small districts with local gasworks tar of constantly varying character; and the general use of rule-of-thumb methods of testing has not been conducive to success. With greater attention to the proper mixing by gas managers, and more scientific methods of testing by surveyors, great improvements in our tar-macadam roadways may be looked for. The question, however, very largely in the hands of the [illegible] with, which will be preferred by most surveyors for [illegible] traffic. They could, however, use a suitable tar as a binder, and bring the [illegible] so generally done by the large firms making tarred slag and limestone, if they are to oust their formidable competitor.

[illegible]

In our issues of June 19 and July 3, 1914, an interesting and valuable article on "Fast Traffic, its Effect on Roads, and the Remedy" was published, and a leader on this, under the heading of "The Physical and Economic Aspect of Road Traffic Problems," appears in the first of the above issues. The article called attention to the destructive effect of the heavy motor traffic, which the writer thought was due not so much to the greater axle weights as to the greatly increased speed in all kinds of traffic at the present day. The damage [illegible] to mere abrasion of the surface, but causes rapid formation of potholes or corrugation, even when the road surfaces are surface-tarred and the road material of an excellent quality. Road engineers were divided into two schools the rigid and elastic. The rigid school depends for the stability and endurance of the road on mass in the foundations, and rigidity in the coat crust and wearing surface. The elastic school are trying to impart some degree of elasticity or resiliency to the road so as to supplement the cushioning effect of the springs of vehicles and rubber tyres. To effect this the elastic school advocate the use of a suitable bitumen and an aggregate of fine stone chippings, 2 in. thick in the middle and 1½ in. thick at the side as a top coat, to be laid as a thin coating or carpeting on to a new or partly worn surface of water-bound macadam. With exceptionally heavy traffic, or a greater thickness of material than 2 in., it should be laid in two coats, the bottom coat being coarser than the top coat, and taking the place of the binder, which will act as a resilient coat to cushion part of the shocks of the traffic which would otherwise be wholly borne by the top coat. One of the most interesting points of this article is the proposal to substitute a 12-in. clinker foundation for the ordinary concrete foundation which is so generally used with thin bituminous road surfaces, on the ground that such a foundation gives a greater resiliency than concrete. A road made under these conditions at Hornsey is cited as being very successful, and free from the waves or corrugations found in roads constructed with the same surfacing material, but with concrete foundations.

CHELTENHAM ROADS CONGRESS.

At the Cheltenham Roads Congress, the president, Mr. H. T. Wakelam, M.INST.C.E., in his opening address, spoke of the close connection there was between town planning and the laying out of arterial roads, and said he thought that arterial roads should be laid out first and town planning should come after. He also briefly referred to the important decisions given in the case of the canal bridge at Worcester, and that of the highway bridge at Crouch End over the Great Northern Railway, in which the courts have held that these old bridges must be kept in such a state of repair that they would be sufficiently strong to carry the traffic which might be reasonably expected to pass along the roads and over the bridges at the present time.

"Highway Law as Affecting the Municipal

Engineer was the subject of a valuable paper by Mr. Sydney G. Turner, ASSOC.M.INST.C.E., Barrister at law; and though the municipal engineer is not expected to be a lawyer he must, if he is to avoid getting himself and his council into trouble, have at least a knowledge of the leading cases dealing with the repair of highways, of extraordinary traffic, and other municipal works.

A short paper by Mr. J. Fred Hawkins, M.INST.C.E., on "The Control, Management and Maintenance of Roads," in which he advocated reducing to sixty the 650 rural authorities controlling roads, on the grounds of greater efficiency and economy in working, naturally provoked some opposition on the part of speakers from rural districts, who feared that the county surveyors wanted to "gobble them up," under the plea of more efficient control and management of the highways.

Considerable discussion took place on a paper by Mr. E. S. Sinnott, M.INST.C.E., on "The Prevention of Sub-crust Movement in Roads." While it was generally admitted that sub-crust movement took place on weak foundations, or on clay or marl, there was by no means general approval of the remedy proposed. To overcome the lateral movement in the sub-crust due to heavy traffic, Mr. Sinnott had designed a rigid framing to be placed at a suitable depth below the surface. This framing is constructed in ferro-concrete, although timber or other material could be used. The general opinion appeared to be that the rigid framing proposed by Mr. Sinnott was unnecessary and costly, and that simpler and more economical means could be adopted. Mr. R. J. Thomas and Mr. Wakelam, two very experienced county surveyors, were of opinion that, by strengthening the sides with good kerbs on concrete, or stones not less than 12 in. deep, and with proper drainage, or with a hand-packed rubble foundation little movement of the sub-crust would take place.

A valuable paper on "The Economies of Modern Methods of Road Construction," by Mr. Francis Wood, M.INST.C.E., was read. Attention was called to the increase in the cost of materials for road making, and the necessity of adopting more economical methods of using these materials. The effect of abrasion when stones are in contact with each other, and at the same time undergoing heavy pressure from traffic, is very great, and is increased by 50 per cent when moisture is added. To avoid this abrasion, bituminous macadam was recommended; and this Mr. Wood has laid 3 in. thick, at a cost of 4s. per super. yard for heavy traffic, and 2 in. thick for light traffic, at 3s. per yard. The paper may be taken as a plea for the use of bitumen instead of tar for mixing with macadam. Tar-macadam tried in Fulham has not been a success, but for the foundations for a top thin coat of bituminous mixture, the old macadam in the roadway was mixed with a special form of tar to make what Mr. Wood names "tar-concrete." The paper contains much useful information with regard to tarred and bituminous materials, and led to a very interesting discussion.

Some Practical Points on Modern Road-work was the title of Mr. W. H. Maxwell's paper, and this contains much useful information with regard to the laying out and construction of roads. Mr. Maxwell was of opinion that the great necessity for most of our roads is to first put in proper foundations and drainage before attempting to put down watertight surfaces. He questioned the wisdom of laying thin surface-wearing crusts or armourings of asphalt and bituminous preparations on existing macadam surfaces, except where an absolutely rigid and dry foundation can be relied upon. Some interesting notes with regard to the use of tar on macadam, mechanical haulage, and traffic statistics are also contained in the paper.

Dealing with somewhat similar matters to the above is the paper by Mr. George Green, M.INST.C.E., on "Grouting and Penetrating Methods of Road Surfaces." This paper dealt with various proprietary methods of making, spraying, or grouting roads; and it led to an animated discussion as to the efficiency or failure of the various methods mentioned.

OTHER PAPERS.

A paper on "Road Construction and Maintenance" was read at a district meeting of the Institution of Municipal and County Engineers at Birmingham by Mr. H. M. Lawson, the deputy road surveyor, and reported in our issue of March 6, 1914. The paper, which is well illustrated with detail drawings showing the various sections of roads and materials in use at Birmingham, dealt with a wide range of materials. Sett and armoured paving, asphalt macadam, asphalt, wood paving, and tar-spraying, all came under consideration, and led to a useful discussion.

A paper on "Traffic Factors," by Mr. J. Eastwood, ASSOC.M.INST.C.E., is published in Vol. clxxxvi. of the "Proceedings" of the Institution of Civil Engineers (see THE SURVEYOR of October 2, 1914). This paper dealt very fully with the various factors which bear on the question of wearing effect on road surfaces, which were summarised as follows: Road—Surface formation, foundation, gradient; class of traffic—weight, intensity of weight, description of tyres, speed, method of shoeing in the case of horses; weather conditions; width of road. A number of very useful tables of traffic factors are given, and the whole paper is particularly valuable to anyone who has to undertake a traffic census.

ROADS AND TOWN PLANNING.

The Town Planning Conference held in Liverpool in March last was largely occupied with the subject of "Roads in Relation to Town Planning." This was introduced by Mr. J. A. Brodie, M.INST.C.E., the city engineer of Liverpool, who drew attention to the need of careful planning for main traffic routes in advance of the laying out in detail of the different areas in a town. To avoid continual widening in the future it is necessary that roads should be made wider than is necessary for present-day requirements, though only such widths as are immediately required should be laid out as carriageways or footways, the other portion being left as grass margins. The provision of ring roads or routes round the city, as carried out in the Queen's-drive in Liverpool, which is 120 ft. wide and 2 miles long, was advocated, so as to allow traffic that did not want to go through the centre of the city to pass round clear of the congested area. The value of ring roads as open spaces and exercise grounds which partake of the character of elongated parks was also dwelt on.

The desirability of providing separate tracks for trams and rapid motor traffic is a matter of great importance, and Mr. Brodie laid special emphasis on the necessity for providing a specially fenced-off track in the roadway, so that the tramcar could be speeded up to compete with the motor 'bus or electric train service. This track need only be laid on sleepers in grass, at a cost of £3,000 per mile, against a cost of £6,000 per mile for an ordinary track. A wider road with a duplicate carriageway would be required, but the saving in track costs would pay for the increased cost of the wider road. The main difficulty in getting wide arterial roads does not lie with the larger boroughs, who are generally alive to the advantage of wider roads, but with the small outside authorities who do not look so far ahead, and who are generally unable to find the funds to carry out such improvements. The feeling was strongly expressed at the conference that there should be a meeting of the various authorities concerned to see if they could agree to some action which would result in the improvements initiated in the large boroughs

being continued in the smaller urban or rural districts.

At the same meeting the city engineer of Birmingham, Mr. H. E. Stilgoe, M.INST.C.E., described the lay out of the Birmingham town planning scheme, which showed that the main roads now running into the city radiate to the centre, compelling all through traffic to pass right through the heavily trafficked streets of the centre of the town. To relieve the centre of this undesirable traffic a great ring road 100 ft. wide is to be laid at an average distance of 1 mile from the city boundary. Inner ring roads are to be laid out to join up the radial roads nearer the centre. An interesting feature of the Birmingham scheme is that the corporation have been able to get the owners to agree to give up land to enable the corporation to widen some of the narrow highways to 100 ft., and in return the corporation permit the landowners to construct their estate roads on a less costly scale. The difference in cost between the 100-ft. arterial road and the 42-ft. street required by the by-laws is borne by the corporation.

A somewhat similar tramway track to that carried out by Mr. Brodie at Liverpool to the Seaforth end on Sea light railway extension on the Thornton Hall Boulevard, which is described in a paper by Mr. E. J. Elford, M.INST.C.E., read at a meeting of the Institution of Municipal and County Engineers at Southend and published in THE SURVEYOR of June 12, 1914. The roadway is 100 ft. wide, has two carriageways and footways, and a central tramway track enclosed with dwarf kerbs. The rails are laid on Jarrah sleepers on screened gravel. The ballast is brought up to the top of the sleepers, and it is intended to cover this with soil level with the top of the rails, and sow the surface with grass after the track has taken its bearings. A short trial length with reinforced concrete sleepers is laid down, but the Jarrah sleeper is used for the greater length as being less expensive, more resilient, more easily packed, and likely to be less noisy, although possibly having a shorter life.

In our issue of May 22, 1914, we discussed the proposed motor speedway between London and Brighton. This roadway was to be 150 ft. wide, and cost £5,000,000. Few details of this motor road have been published, but it is a scheme which all highway engineers will follow with interest should it get beyond the proposal stage.

THE TRAINING OF HIGHWAY ENGINEERS.

"The Training of Highway Engineers" was the subject of a very able and useful paper by Mr. H. Percy Boulnois, M.INST.C.E., read at the annual meeting of the Institution of Municipal and County Engineers, and further attention to this subject was drawn by the report of the Special Committee appointed by the Institution of Civil Engineers to consider the "Practical Training of Engineers." As was to be expected from a municipal engineer of Mr. Boulnois' experience and standing, his paper was full of practical suggestions, and was especially useful to the younger highway engineers. He called attention to the great change taking place in the traffic on our roads and the necessity of adopting more scientific methods of road making in order to cope with the greater weights and increased speeds of the vehicles using the roadways. He suggested that a new profession of "Highway Engineer" was on the eve of formation, and that the question of his training was worthy of consideration.

While Mr. Boulnois is far too practical a man to imagine that technical calculations and laboratory experiments are sufficient to make good roads, he considered that all highway engineers should combine a knowledge of these matters with practical experience of road making. He quoted with approval the subjects taught in the Columbia College, New York, as a special course of training in highway engineering, and with the recent appointment of Mr. Matthews as the Professor of Municipal Engineering at the London University we may be considered to have made some progress towards the goal at which he aims. While, however, he advocates technical training in colleges, he agrees that this must be followed by practical experience obtained as an articled pupil under a responsible road engineer or surveyor. He very wisely says: "Intuition, common sense, originality, a knowledge of men and how to handle them, the value of materials, and many other subjects cannot be taught in the 'schools,' and can only be acquired when the 'rough and tumble' of the professional life is commenced, and it would be during his pupilage that the young highway engineer would acquire these necessary additions to his store of knowledge." He believes, however, that this demand for more science should also be accompanied by a demand for more pay.

The report issued by the Institution of Civil Engineers on "Practical Training of Engineers" was the result of an inquiry held on March 31, 1913, but only published in the autumn of last year, and attempts to define and regularise the conditions of practical training for young engineers who might be likely to seek admission into the institution. It was intended to apply to two classes of young men, namely:

(a) Those who take a regular pupilage or apprenticeship, but who do not receive systematic collegiate technical education; and

(b) Those who take a three-year course in good engineering colleges and obtain degrees or diplomas recognised by the institution as exempting from the associate membership examination, with a shorter period of practical training.

The inquiry was conducted by Dr. W. C. Unwin and three members representative of the municipal engineering profession in the persons of Sir Maurice Fitzmaurice, Mr. J. A. Brodie, and Mr. S. S. Platt, with the secretary of the institution, formed the committee of inquiry. The inquiry largely turned on the question of the merits of pupilage *versus* college training, and while the chairman, as an old University professor, was supported by Mr. Platt, in his preference for college or university training first and pupilage after, Mr. Brodie was strongly in favour of pupilage, followed by instruction at night in a good college or university. Mr. Brodie put the matter in a nutshell by saying it was a "question of the well-educated average man with good practical ability, as compared with the highly educated man without the practical ability. My own view is that the practical man will come through at the finish." Mr. Platt had made up his mind not to take any more pupils unless they had had three years' technical college training, but Mr. Brodie did not agree with that. He said: "I want a good standard of engineering education. If you give me a man who has worked in the office and on the works, and educated himself up to the same standard as he gets at the university, I will take him every time in preference to the university man."

It has for many years been a matter of complaint that the examinations held by the Institution of Civil Engineers are simply of an academic character, suited to the students of the professors who act as examiners, and that a young engineer's practical training is not of the slightest use to him in these examinations. Mr. Brodie, in his outspoken remarks to the chairman, said: "We know cases where people have got through your examinations who probably would not get through the examinations of the Institution of Municipal and County Engineers, because the latter body, before passing any of their people, bring these men into a room and put them through a *viva voce* examination with the object of testing their practical knowledge of engineering."

The essentially sane, common-sense point of view adopted by Mr. Brodie, in which he was to a very

large extent supported by Sir M. Fitzmaurice, must commend itself to all municipal engineers, and especially highway engineers; and it is a matter of congratulation that the Institution of Municipal and County Engineers have during the past year decided to adopt a special examination for county and highway engineering. That this will lead to a closer study of the theoretical and scientific side of highway engineering, while giving due weight to its practical side, there can be no doubt; and it is to be hoped that the younger members of the profession will rise to their opportunities by obtaining the certificate for this examination.

HOUSING AND TOWN PLANNING.

A large number of housing schemes have been taken in hand during the past year, and however much this important work has been neglected in the past, since the Housing and Town Planning Act of 1909 came into force neglect and apathy have disappeared. Instead of housing schemes being confined to a few large towns, we now find small towns and rural districts in all parts of the country taking up this matter and spending large sums of money on this very necessary branch of municipal work. Not only is the pressing need of more housing accommodation recognised, but one of the most remarkable features about the housing schemes of the past year is the large number of schemes which are being carried out as the result of open competitions. This denotes an improvement in the public taste, for whereas a few years ago it was considered that any unlovely box of a cottage of the cheapest and plainest character, or a barrack-like tenement, was good enough for housing the working classes, we now find that many of the best architects in the country are giving their attention to this matter and competing for the privilege of designing this class of building.

Among the more important housing schemes for which competitions have been held by local authorities may be mentioned those promoted by the Corporations of Manchester, Liverpool, Chester, Doncaster, and Southend. Several smaller places have also held competitions, and those which have been decided have elicited keen competition. It is pleasing to find that in several competitions young architects have been successful, and, in one case at least, with a somewhat notable departure in style from that usually found in cottage design.

In other directions efforts have been made to provide a better planned and more attractive elevation for cottages, and two important competitions which have been held with this view are those promoted by the publishers of *Concrete* and *Country Life*.

Although both these competitions were promoted to meet the Government's proposal to build one 100,000 cottages, they differed very largely in character. The cottages in the *Country Life* schemes were intended to house agricultural labourers, and a special feature was to be made to preserve local characteristics in the building, to use as far as possible local materials, and to exclude modern substitutes for bricks, stones, tiles, and slates. The proprietors of *Concrete*, on the other hand, while desiring designs suitable for different types of small cottages, wanted concrete to be used as far as possible to illustrate new materials and new methods of construction, and the designs were to give careful consideration to the economies that could be effected by the use of these new materials and methods.

In the *Country Life* competition £514 was awarded in premiums for some eighteen different designs suitable for fifteen different counties, and nearly 1,500 designs and models were sent in by 900 competitors. Two types of cottages were required, one somewhat larger than the other, with the maximum floor areas and cubic capacities recommended by the Small Holdings Committee Report, and to provide a living-room, scullery, pantry, and three bedrooms. The average estimated cost for a pair at 1*d.* per cubic foot was £360, or nearly £180 per house, which is very near the cost per house most cottage schemes work out at.

Costs vary considerably in different parts of the country, but the £180 may be taken as a price at which a suitable cottage could be built in most parts. Lord Salisbury, in opening the Liverpool Town Planning Conference, stated that "he had proved that they could build a first-rate cottage for £200, a very nice cottage for £150, and he was now absolutely building a very adequate one for £130." The size of the rooms and the quality of the materials and workmanship must differ considerably to bring about such great variation in price. It need only be said of the *Country Life* designs that they provide a very attractive type of cottage, and could in most cases be built for something near the estimated cost; but there are one or two of the designs which are like a small manor house, and which could hardly be built in suitable materials for £250 per house. A special competition for a pair of houses to cost £250 the pair was also held, and attracted some very interesting schemes. The first premiated scheme was well planned, with a roof of the mansard type. The outer walls were thin concrete slabs, which would not comply with the model by-laws; but most of the other schemes submitted were for brick walls—hollow or solid—and would comply with the by-laws in most districts, though the height of the rooms—8 ft. on the ground floor and 8 ft. 6 in. for two-thirds of the height of the bedrooms on the first floor—would not meet the requirement of many towns and urban districts.

The £125 Concrete Cottage Competition was in many respects much more interesting than the *Country Life* competition. £215 was given in prizes, and some 249 sets of drawings were submitted. The conditions of the competition required a design suitable for execution mainly in some form of concrete instead of in brick, tile, slate, stone, or carpentry. The accommodation required was practically the same as in the other competition—kitchen or living room, scullery, and three bedrooms, with places for food, fuel, and sanitary convenience. The price of £125 was exclusive of builder's profit, sanitary fittings, fences, and land drainage, &c., which would almost certainly add another £25 to the cost, and so convert the £125 into a £150 house. The height and area of the bedrooms is a matter of great importance, though few by-laws make any provision dealing with the area or cubic space of living-rooms. Mr. Arnold Mitchell's famous £100 cottage was in most persons' minds altogether too small in area to provide sufficient air-space for any one to live in with comfort or health. The winning design by Mr. E. S. Thompson, 5 Victoria-street, Westminster, London, S.W., which is given in THE SURVEYOR of July 10, 1914, is for a single cottage of one story, the walls, roof and floors being concrete, and has a living room of 185 ft. area, scullery 56 ft., 3 bedrooms 102 ft., 106 ft., and 125 ft. in area respectively, and the height of the rooms is 8 ft. A small larder, water-closet, and fuel-store are all under the main roof, which is flat.

Other large housing schemes being carried out without competition are the Rosyth scheme, on which the Government propose to spend a million pounds and erect 8,000 houses; the Port of London scheme for 164 houses, laid out 22 to the acre; Eastbourne 143 houses, Kilmallock, Ireland, 243; Greenock 250, and Hull 252.

A report on the wretched housing conditions in Dublin was presented by a departmental committee (see THE SURVEYOR, April 24, 1914), who recom-

mended the rebuilding of the slum areas of the city, and the erection of 11,000 houses at an estimated cost of £3,500,000. As there are, according to Mr. Birrell, 20,108 families occupying one-roomed tenements, it cannot be said that the recommendation is not needed.

An interesting experiment is to be made in Manchester, where the council in May last approved a scheme for spending £8,973 on furnished houses in Rochdale-road. It was stated that the number of people using lodging-houses in Manchester is from 60,000 to 80,000, and that this roving population never possessed enough furniture to load a hand-cart. It is proposed to build houses with three independent living rooms, and let each room at a nominal rent by the day or week. Nearly all the furniture will be fixtures, and cookery utensils and crockery will be provided. The scheme was opposed by a deputation of clergy, who waited on the Lord Mayor, as they feared that a certain percentage of the houses would become hotbeds of vice.

The Government's Bill for providing three millions of money to meet the deficiency of housing accommodation in rural areas will do much to remove what has become a national evil. To arrest the depopulation of the country and the overcrowding of the towns a large number of low-rented cottages will have to be erected, and the Government scheme has the support of all parties.

A number of housing schemes have been illustrated in our columns during the past year, among them being schemes at Atherstone, Cheltenham, Dover, Southwold, Abersychan, Evesham, Hinckley, and Tilbury.

The housing question was dealt with in several papers at the Town Planning Conferences at Cheltenham and Liverpool. At Cheltenham the city engineer of Coventry, Mr. J. E. Swindlehurst, M.INST.C.E., dealt with the "Abnormal Development of Coventry, and Some of its Town Planning and Housing Problems," and gave some very useful information with regard to the types of houses being built, and the lay-out of the working-class areas. Mr. J. C. Midgley, the deputy surveyor of Newcastle-on-Tyne, dealt with the "Housing and Town Planning Act, 1909, as Applied to Commercial and Industrial Districts," and Mr. Ernest Holloway, surveyor to the Evesham Rural District Council, read a paper on "Housing in Rural Districts."

At the Liverpool Conference Mr. F. T. Turton, the deputy surveyor, opened a discussion on "Urban Housing," and dealt with the impossibility of removing slum dwellers into the outskirts of the town, and the necessity for the corporation to provide housing accommodation in close proximity to factories and the dock area. He thought that tenements were a necessity, but he had tried to get away as far as possible from the tenement appearance by giving every tenement a front door leading from a balcony. The tenements worked out at about fifty to the acre. Self-contained houses worked out on another site at thirty-one to the acre.

"Suburban and Rural Housing" was dealt with by Mr. Percy T. Runton, A.R.I.B.A., the architect of the Hull Garden Suburb. He gave some very useful information with regard to the cost of detached and semi-detached houses, and estimated that a detached house costs 12 per cent. over the cost of houses in groups of six. The effect of concrete construction was discussed, but did not find favour for cottages; and the effect of standardisation of fittings and economic methods of construction was also dealt with. Mr. Henry Vivian dealt with "The Co-partnership System of Housing," and Mr. E. C. Culpin with "The Garden Suburb."

TOWN PLANNING.

The feeling on the question of town planning between the architect and engineer is not so acute as it was a few years back. Each now recognises that the other has his place in a well-designed scheme. In the accepted scheme for the laying out of the Australian capital there were engineering mistakes that could only be made by an architect, but at the same time it displayed architectural qualities that few engineers could hope to possess. The architect is obsessed with the view that physical difficulties must give way to a symmetrical arrangement on his plan, and he frequently shows an utter disregard to economical construction in his efforts to produce artistic effects. An engineer would never design roads with a gradient only suitable for a rack railway, nor would he dream of erecting an important building on an old river-bed, or of making a symmetrical lake of such a size that all sense of symmetry is lost in space. He is, however, at times too practical to grasp the artistic possibilities of a well laid-out town, and it is for this reason that an interchange of ideas between architects and engineers on the subject of town-planning is so valuable. They can each correct the other's faults, whether it is in the matter of temperament or training. It is for reasons such as this that Town-planning Conferences like those at Liverpool and Cheltenham are so valuable, affording as they do so many opportunities of comparing notes and interchanging ideas.

The conference at Cheltenham held at their annual meeting by the Institution of Municipal and County Engineers was not only of a very interesting character, but was particularly instructive owing to the valuable collection of town plans which were exhibited. It was one of the most complete collections ever got together, and showed the best examples of Continental, American, Colonial and British town plans. Some of the many garden suburb schemes, with their family resemblance, might perhaps have been spared, and the many exhibits of a purely historical or local character from Germany might with advantage have made room for more modern and more interesting work; but still, taken on the whole, it was probably the most interesting collection of town plans that has yet been got together.

Particularly interesting to municipal engineers, as representing the official engineering side of town planning, were the large cartoons showing the Birmingham, Liverpool, Newcastle, and Dundee schemes: the scheme by Mr. J. Thomson, M.INST.C.E., the City Engineer of Dundee, being shown by, perhaps, the finest set of drawings in the exhibition. Not only was the scheme an exceedingly clever piece of planning, but the buildings were architecturally and monumentally fit to compare with the public buildings of any other city in this country. The unofficial town planner was worthily represented by the premiated designs for the town-planning competitions held at Halifax, Huddersfield, Oldham, and Ruislip-Northwood, though some of these were really estate development plans rather than town-planning schemes in the widest sense. America, Canada, and New Zealand sent a number of very fine plans, in which landscape gardening played the most prominent part. School playgrounds and shelters at Chicago and Ohio, the lay-out of parks at Sacramento and Schenectady (New York), waterfront developments at Toronto, and the town plans of Washington, Boston, and Vancouver all showed the high state of development of town planning on the western side of the Atlantic. Australia was represented by some of the competition plans for the Federal capital, India by plans for city improvements at Lashkar, lent by Mr. H. V. Lancaster, F.R.I.B.A., and Calcutta by the plans and reports lent by the ex-city engineer, Mr. E. P. Richards, M.INST.C.E. Germany's principal town-planning schemes, and plans of the towns in the Netherlands, Italy, France, and Russia were all exhibited. A large number of housing schemes and plans dealing with condemned areas, the premiated designs for artisan dwellings and public parks in the competitions held by the Institution of Municipal and County Engineers, the valuable collection of photographs lent by Professor Geddes, and the set of diagrams by Mr. Raymond Unwin, F.R.I.B.A., were all exhibited, and offered opportunities of study which no town planner could afford to neglect.

Though less complete in many respects than the exhibition at Cheltenham, that at the Liverpool Town Planning Conference was very interesting, and particularly so to local enthusiasts. There was a very fine collection of plans and engravings of old Liverpool, a model of Port Sunlight, Mr. T. H. Mawson's designs for laying out Vancouver and Saskatchewan, and the replanning of Bolton, and Mr. H. Chalton Bradshaw's *Prix de Rome* drawings for a "Civic Centre in a Great City."

One of the most interesting events of the past year has been the commission given to Mr. T. H. Mawson by the King of Greece to prepare plans for the extension and remodelling of Athens.

Other important town planning schemes which may be noted are those for replanning the central areas of Blackburn, Exeter, and Bradford. The Blackburn scheme is the joint work of the borough engineer, Mr. W. Stubbs, A.M.INST.C.E., and Mr. Walter Stirrup, F.R.I.B.A., a local architect; and the scheme for the replanning of the centre of Exeter has been prepared by Mr. Mawson. The scheme for the replanning of Bradford is thrown open to competition, three prizes being offered of £500, £300, and £200, and Mr. Reginald Blomfield, A.R.A., is the assessor. A competition has also been held for a rebuilding scheme in the city of Glasgow, and for a town planning scheme for the city of Dublin, for which the Lord-Lieutenant offered a prize of £500.

During the past year several works on town planning have been published, but by far the most important and ambitious is that published in Paris by H. C. Anderson on the "Creation of a World Centre of Communication." Strictly speaking, this book was published in 1913, but only introduced to the notice of town planners here early last year. This, in the opinion of the authors, Messrs. Anderson and Hebrard, is to be an International Centre of Civilisation, and comprise three parts—a Physical Culture or Olympic Centre, an Art Centre, and a Scientific Centre. The Olympic Centre has a very large stadium and a huge natatorium facing the sea, with gymnasiums for men and women to the right and left. The Art Centre contains a central temple of art, a conservatorium for music and drama, with museums, schools, and libraries. The Scientific Centre is dominated by a Tower of Progress over a thousand feet high. Everything is planned on a gigantic scale, and the book is a monument to the industry and skill of its authors. It is on too large a scale to find a place in many private libraries, as it is 18 in. long by 12 in. broad, and weighs 10 lb. Whether it is possible or desirable to carry out such a scheme is extremely doubtful, but its value to the student of town-planning is unquestionable. It is particularly valuable to the municipal engineer in that it forms a corrective to his all too practical work, and enables him for a time to soar into the clouds beyond the reach of the parsimonious ratepayer.

MUNICIPAL AND PUBLIC BUILDINGS.

While municipal activity in this country during the year 1914 has again been chiefly directed towards improving the housing of our working-classes, there have, both at home and abroad, been many important schemes launched for buildings of a large and monumental character. Among the latter may be mentioned the Government buildings at Delhi, the proposed Federal Parliament House in the new Australian capital of Canberra, and the Board of Trade Offices between the Embankment and Whitehall. The Government buildings at Delhi are estimated to cost £2,800,000, while the cost of the whole scheme is estimated at £6,000,000. The drawings of the Secretariats and Government House at the New Delhi, which form the huge block of buildings designed by Mr. E. L. Lutyens and Mr. Herbert Baker, were exhibited at the Royal Academy last year. Though the drawings were of a somewhat sketchy and impressionist character, they were sufficient to show that the aim of the architects, as set forth in their report, is likely to be realised. This was "to express the ideal and fact of British rule in India, of which the New Delhi must ever be the monument."

The Australian Government last July announced an international competition for the purpose of selecting the architect of the Federal Parliament House, on which the outlay was not to be more than a million pounds. Only outline sketch designs for the building were requested, and eight prizes, amounting to £6,000, were offered, the first prize being £2,000. The designs were to be submitted by the end of March, 1915, in either Melbourne or London, to a jury of architects, whose decision was to be final. The architects who were to act as assessors were Mr. G. T. Poole, Australia; Sir John J. Burnet, London; M. Victor Laloux, Paris; Herr Otto Wagner, Vienna; and Mr. Louis H. Sullivan, Chicago. This competition promised to be one that would attract many of the leading architects in this and other countries, as, unlike the competition for the lay-out of the Federal Capital, in which the final decision was reserved for a member of the Australian Ministry, the decision now lay in the hands of experts who have the confidence of the architectural profession. Unfortunately, the war has made so many demands upon the architectural profession of this and other countries, that it has been decided to postpone the competition for a time. It is to be hoped that as so much dissatisfaction was, and is yet, felt over the result of the former competition for laying out the capital, the opportunity may be taken of holding a new competition which will attract a much wider and more important body of town-planning experts than was the case in the previous competition.

At home, the competition for the Board of Trade Offices led to the submission of 187 designs, and the authors of ten of the designs, who were each given an honorarium of £300, were selected to take part in a final competition. The cost of the two blocks of buildings is likely to be over £500,000, and the assessors are Sir Aston Webb, Mr. Reginald Blomfield, and Mr. Ernest Newton.

Another important competition, limited to half a dozen architects, was that held by the Metropolitan Water Board for new central offices on a site in Rosebery-avenue. The successful architect was Mr. H. Austen Hall, F.R.I.B.A., and the estimated cost of the building is about £100,000.

Sixty-nine sets of designs were submitted for the Belfast Public Art Gallery and Museum Competition, and exhibited in May last in the Ulster Minor Hall, Belfast. This building, as is becoming so much the fashion now, is to be erected in a public park; and it was necessary to provide a separate entrance from the public roadway for use at such times as the main entrance from the park was not available.

The tendency to place our art galleries and museums in beautiful surroundings such as a park affords has much to recommend it, and has already been adopted in Manchester, Bradford, and other towns.

Considerable progress has been made during the past year with the London County Council Hall on the Thames Embankment, but it must be some years yet before we can look for its completion.

Two important buildings recently completed in South Africa are the Johannesburg Town Hall and Municipal Buildings, erected at a cost of £300,000, and the new Law Courts at Capetown, which cost £220,000. In both these buildings reinforced concrete was very largely used.

One of the most important buildings commenced during the past year is the Glasgow Municipal Buildings, the foundation-stone being laid by the

King in July last. The cost of this building is estimated at £168,228, of which £137,728 is for new buildings, and £30,500 for altering the existing buildings.

Competitions for town hall schemes have been held for the Barnsley, Dudley and Middleton Corporations, and the first premium for the last-named scheme was awarded to one of the most brilliant draughtsmen in the architectural profession—Mr. Alick G. Horsnell. Other competitions have been under consideration for new town halls at Newcastle-on-Tyne and Warrington.

Among public buildings described in our columns may be mentioned the new public offices for Hartlepool (April 3, 1914), the Newburn Council Offices (April 17, 1914), and Ipswich Public Health Offices, which were described in a paper read at Ipswich by the borough surveyor, Mr. J. R. Mead, at an Eastern District Meeting of the Institution of Municipal and County Engineers, the paper being published in THE SURVEYOR on May 22, 1914.

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During the past year the London County Council have made somewhat of a new departure by holding competitions for two schools—one at Latchmere-street, Battersea, and the other at Billingsgate-street, Greenwich. The designs of new schools have hitherto been made by the official staff of the Superintending Architect's department, and probably it was hoped to introduce new ideas by holding a competition, though nothing very novel was to be found in any of the designs submitted. Fifty eight designs were sent in, forty-five being for the school at Battersea and thirteen for the Greenwich school. The Battersea school was awarded to Mr. Arnold Mitchell, F.R.I.B.A., and Messrs. Wright and Chapman obtained the Greenwich school. The Battersea school is a one storeyed building of reinforced concrete and reinforced brickwork, and the estimated cost of the building at 8d. per cubic foot is £18,097, which works out at £14 9s. 1d. per place, there being 1,252 places in the school.

The Southport Education Committee in July last invited architects to submit designs for new technical schools, and offered premiums of £75, £50, and £25 for the three best designs, Mr. Paul Waterhouse being the assessor. The school is to have its main frontage to Lord-street, is to accommodate 250 male and 250 female students, and have a large examination hall, education offices, engineering laboratories, building workshops, natural science, chemical and physical laboratories, commercial and domestic departments, and a school of art.

A technical institute is also to be erected at Coventry at a cost of £24,500. The Tottenham Education Committee are to erect a school for 900 scholars, 300 each for junior boys and girls and infants.

A school erected at Ealing by the Middlesex Education Committee is described in our issue of April 24, 1914, and is interesting on account of the extensive use of reinforced concrete carried out on the Indented Bar and Concrete Engineering Company's system.

A large open-air school is to be erected in Lodercoad at an estimated cost of £19,250 for the Brighton Education Authorities; another open-air school is to be built at Huddersfield.

The growth of the open-air school has not been so rapid as could be desired, when one considers the many advantages it offers from the hygienic and economic point of view. It is proved beyond doubt that the children trained in these schools are better physically and mentally then those educated in the ordinary type of elementary school, which is so frequently badly ventilated and lighted. The buildings need only be of an inexpensive type, and the only difficulty with many education authorities is to find suitable sites within reasonable distance of the scholars' homes. Apart from the health point of view, pleasant surroundings have great educational and moral value, and it is therefore very desirable that these schools should be built in a large open space, preferably enclosed as a garden or a small park. In addition to the ordinary classrooms and teachers' accommodation, a resting-shed, dining-room, kitchen, and baths are required in an up-to-date open-air school, for, if pleasant surroundings are to be obtained, it may mean that the scholars will be too far from their homes to go there for their mid-day meal, and provision has to be made for many of the children to get it in the school. The health of the child is becoming a matter of vital national importance, and good feeding is quite as essential to the child's well-being as good teaching.

The Building Regulations for Public Elementary School have been revised during the past year, and new regulations have been issued giving full instructions with regard to the principles of planning and fitting up new schools. These regulations, on which some comments were made in our issue of July 31, 1914, are worthy of careful study by all who are engaged in the design and maintenance of school buildings.

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A large number of [illegible] baths and washhouses have been [illegible] or completed during the past year, and while the more general supply of domestic baths which are now found even in small cottages makes it unnecessary to provide so large a number of slipper baths [illegible] it is considered advisable to provide a limited number, particularly in the case of [illegible] Through swimming in winter is indulged in by an increasing number of people—and there does not appear to be any reason why with good heating arrangements it should not be much more generally [illegible] baths ought to be designed with a view to converting the bath hall in winter into a gymnasium or a small public hall for cinema or other purposes.

In our large inland health resorts great sums have been expended in order to bring their baths into line with the fashionable Continental spas; and there can be no doubt that the opportunity offered them by the war will be readily accepted, and that they will gain much of the custom that has fallen to Homburg, Marienbad, and other German and Austrian spas.

Turkish and other similar baths are very popular at all our leading spas such as Bath and Harrogate; but in the case of small authorities it is questionable whether there is a sufficient demand to justify the expense of installing these rather costly luxuries. It may be possible to adopt some cheaper form of Russian bath, especially in the colliery or ironworkers' districts; though the average collier has not yet been persuaded of its necessity, and has not taken too kindly to the offer of providing baths at the pithead.

Open-air baths are becoming more popular, and appeal more to English tastes than the indoor heated baths; and there appears to be every likelihood of their number being largely increased in the near future, and especially in the case of seaside resorts.

The provision of washhouses is by no means so general as the provision of baths, and, except in the case of the poorest classes, it is questionable whether they are ever likely to become popular. Steam laundries have now become a very important and lucrative business in all large towns; for in most cases householders find it more convenient, and often more economical, to send their washing to a laundry than to get the washing done at home with the aid of a washerwoman. Still, in large industrial towns there is no doubt that there is a demand for washhouses, and this demand is met to a very great extent by the municipal authorities.

Among the larger authorities erecting baths may be mentioned the Sheffield Corporation, who are proposing to erect baths and washhouses at an estimated cost of £24,214; the Coventry City

Council, who are to spend £15,000 in extending their baths; Birmingham Corporation, who are to spend £19,262 at Saltley; Preston Corporation, who, after many years' consideration, are going to erect baths at a cost of £17,000; Darwen, £6,550; Deptford, £6,500; and Renfrew, £6,000.

A competition for a bath at Hendon has recently been decided, the first premium having been awarded to Mr. T. Millwood Wilson, L.R.I.B.A.

Rough sketch plans have been presented to the Bath Corporation Baths Committee by their architect, Mr. A. J. Taylor, for the enlargement of the bathing establishment. The cost of the buildings, fittings and furniture is estimated at £48,132. Another £5,000 is to be spent on an arcade promenade, new lounge at the Pump Room, and additional pumping plant; and with contingencies and the cost of the site the total cost will amount to £86,860.

Open-air swimming-baths, other than those at the seaside, for which the Local Government Board have been asked to sanction loans, are the baths in Bushey Park, and Lister Park, Bradford. The bath in Bushey Park is to cost £1,150, and is to be supplied with water from the Cardinal Wolsey River, which irrigates Hampton Court Garden. The bath in the Lister Park is to cost £5,740.

New public washhouses and wash-baths have been opened during the past year in New Quay-street, Manchester. The wash-bath has nine wash-baths for men and seven for women, and the wash-house has sixteen stalls, sixteen drying-houses, hydro extractors, steam-driven mangles, and all the up-to-date equipment of a modern laundry and wash-bath. Special provision is made for school children having free bathing.

Further public washhouses are to be erected in various parts of Manchester amounting to 142 washing-stalls, estimated to cost £17,530.

SANATORIA AND HOSPITALS.

Several large schemes for sanatoriums and hospitals have been decided on during the past year. Bradford is proposing to construct a new infirmary at a cost of £200,000. The King Edward Memorial Hospital at Hastings is to cost about £50,000. Salford Corporation are to erect a new tuberculosis sanatorium at Nab Top, Marple. The Metropolitan Asylums Board, Middlesex County Asylums Board, Wilts County Council, Essex County Council, and the corporations of Oldham, Rochdale and Southend all have schemes for erecting sanatoriums.

As an offset to this activity, attention may be called to a list of counties and county boroughs who have not yet provided sanatorium accommodation. This was given in the House of Commons in March last by Mr. Herbert Samuel, and may be found in our issue of March 20, 1914.

On February 13th of last year the Local Government Board issued a new "Memorandum on Provision of New Residential Institutions for the Treatment of Pulmonary Tuberculosis," which had been prepared to afford local authorities and others further assistance in the provision of special residential institutions for permanent schemes for treatment of pulmonary tuberculosis. The memorandum, which was published in The Surveyor, February 20, 1914, dealt very fully with the question of economy in building, site, subsoil, drainage, water supply, ease of access, the buildings needed, and the accommodation required for patients. The memorandum contained a number of interesting plans, and very clear and concise particulars as to the requirements in the various buildings, and will repay careful study by any one having to provide sanatorium accommodation.

A new annexe to the Whittingham Asylum, erected for the Lancashire County Council at a cost of £154,000, was opened last year.

OTHER BUILDINGS.

Among other buildings described and illustrated in our columns during the past year may be mentioned the Bemerton main sewerage pumping station, May 22, 1914; Southend-on Sea refuse destructor and pumping station, and pier, June 12, 1914; Lytham refuse destructor and pumping station, and slaughterhouses, June 19, 1914; and the Basingstoke electricity station, October 23, 1914. Slaughterhouses are to be erected at Nelson, £14,000, and at Liverpool £30,000.

REFUSE DISPOSAL.

There still remain a large number of places where the methods in use for the disposal of refuse are unsatisfactory, and where they not only constitute a nuisance, but may even be dangerous to health by contaminating the water supply. The whole subject was dealt with in an admirable lecture delivered at University College a short time ago by Prof. E. R. Matthews, Assoc.M.Inst.C.E., Chadwick Professor of Municipal Engineering in the University of London. This lecture was printed in these columns on November 13th last, and those of our readers interested in the subject may refer to it with advantage.

METHODS OF COLLECTION.

The question as to the best type of vehicle to adopt for the collection of house refuse has been discussed on various occasions. Early in 1914 an important report in connection with this subject was made to his council by Mr. J. G. Carey, engineer and surveyor to the Heston and Isleworth Urban District Council. After making trials in the actual collection of house refuse with an electric motor vehicle, a superheated steam wagon and a petrol wagon, it was found that the greatest saving over horse traction was shown by the electric motor vehicle—viz., £71 12s. 11d. per annum if the council's horses were used, or £145 4s. 6d. per annum on the basis of hired teams at 9s. 9d. per day. The steam wagon showed savings of £66 13s. 9d. and £140 5s. 4d. respectively. We do not understand why two days per month were allowed for overhauling the steam wagon, while only one day per month is allowed for the same purpose in the case of the electric vehicle. If this item in the two calculations were estimated at the same figure, the results would be entirely in favour of the steam wagon, especially as the steam wagon can draw a trailer, whereas the electric vehicle cannot do so. We understand that the council eventually decided to purchase the electric vehicle, but we do not think that the results of the trials demonstrated any great advantage, if any, over the steam wagon, and it would be very interesting to have further tests made with different types of vehicles under uniform conditions of working.

Some interesting information was collected early in the past year by Mr. J. W. Walshaw, city surveyor of Peterborough, with regard to the hours of refuse collection. It was ascertained that in fourteen towns the hours were practically the same as at Peterborough—from 8 a.m. to 10 a.m. in the town itself, and from 7 a.m. to 4.30 p.m. in other parts. In four towns the work was finished at 9 a.m., and in two other places at noon.

REFUSE DISPOSAL IN CAMPS.

The article on this subject, contributed by Mr. G. Bertram Hartfree, F.S.I., engineer and surveyor to the Alton, Hants, Urban District Council (The Surveyor, October 30, 1914), was very interesting and altogether practical. The extremely unsatisfactory conditions which arise, particularly in connection with hospitals for the wounded, render the provision of suitable

destructors of prime importance, and, as it is impossible to construct modern permanent destructor installations in the time at disposal under such conditions, Mr. Hartfree's suggestions for rough and ready incinerators, which can be constructed from almost any material, should be very useful.

We understand that a trial is being given by the War Office to a new form of refuse disposal specially suitable for camps, and we shall hope to have some record of the results obtained in due course.

CONVERSION INTO MANURE

In the lecture upon refuse disposal by Prof. E. R. Matthews, mentioned above, reference was made to the difficulty of utilising house refuse as manure, and the failure of three factories in France, erected for the purpose of pulverising refuse and rendering it suitable for use as manure, was quoted. It was alleged that the farmers found the product of these factories excellent at first, but that after three or four years they found that its beneficial effect had lessened, and that the land needed a change, with the result that the farmers discontinued the use of the manure and the companies failed. It would have been interesting to learn whether the manure maintained the good qualities it is stated to have possessed at first, and whether it was properly applied by the farmers.

The statements made in the lecture brought a letter of protest from the Patent Lightning Crusher Company, Limited (THE SURVEYOR, November 27, 1914), pointing out that in this country the use of manure produced from house refuse by means of this firm's crusher is continually increasing. The quantities sold by the Metropolitan Borough of Southwark alone have risen from 2,206 tons in 1907 to 19,495 tons in 1914, and the demand now exceeds the supply. Further, it is stated in the letter that the corporation of Hove, Sussex, after having had a plant in operation since 1913, are now about to instal three more machines.

NEW INSTALLATIONS OF REFUSE DESTRUCTORS

A number of descriptions of new destructor plants have appeared in these pages during the past twelve months.

Ramsbottom (THE SURVEYOR, January 23, 1914). —In this case the plant consists of two cells on the continuous grate principle, and was designed to deal with 14 tons of refuse in sixteen hours. It was estimated that, after taking into consideration several economies effected, the working of the plant, including repayment of sinking fund and interest, would amount to a trifle under 1d on the rates.

Lincoln. — The erection of a new refuse destructor for this city was commenced in February last. It was designed to deal with 65 tons of refuse per day, and it was estimated that by using the heat generated by the refuse for raising sewage at the adjacent sewage pumping station there would be a saving of £900 a year in the coal bill.

Doncaster (THE SURVEYOR, March 27, 1914).—This new plant consists of four grates arranged as continuous cells. On tests the best result showed that the refuse was being burned at the rate of over 82 tons per twenty-four hours.

Southend-on-Sea (THE SURVEYOR, June 12, 1914).—The refuse destructor plant described in the paper by Mr. E. J. Elford, borough engineer, consists of six cells, and it was estimated that these would provide sufficient steam to pump the dry-weather flow of sewage for five and a-half to six days in each week.

Cleethorpes (THE SURVEYOR, September 25, 1914).—This plant consists of four cells in two units, with a combined capacity of 50 tons per day.

REFUSE DISPOSAL ABROAD

In America there is still a tendency to adopt what is known as garbage reduction plant instead of incinerators. An interesting report upon the refuse disposal of Trenton, N.J., by Messrs. Hering & Gregory, consulting engineers of New York, was published early in 1914, and it was shown that the nett annual operating cost of a reduction plant, including sewage pumping station, would amount to about £14,628, while the figure for an incineration plant would be £9,476. This indicates one reason why the engineers recommended the adoption of the latter method. It was proposed to use the heat from the destructor to generate electricity and to transmit the current to the pumping station at the proposed new sewage disposal works.

From a report upon the disposal of the refuse of Toronto, Canada, it appears that it was considered advisable to deal with the garbage or kitchen refuse separately in a reduction plant, and to burn the rubbish in an incinerator and utilise the power developed in the rubbish furnaces in the reduction plant.

In a report upon the disposal of refuse in Chicago, issued about the same time, somewhat similar recommendations were made. Six different proposals were considered, and the scheme recommended consisted of the disposal of garbage in a central reduction plant, and the burning of rubbish in small incinerators, one in each of fourteen collection districts, except one which is already provided with an incinerator for the total destruction of all garbage and rubbish. It was estimated that in 1920 the enormous amount of over 1,300,000 tons of material will have to be collected and disposed of.

REFUSE DISPOSAL IN LONDON

The difficulty of refuse disposal in large cities is often greater than in smaller towns, owing to the problem of securing suitable sites for destructors and the cost of transport. The very large quantity of refuse to be handled in Chicago is mentioned above. In Manchester it amounted to over 312,000 tons in the year which ended March 31, 1914. In reporting upon the subject at the beginning of the year, the Highways Committee of the Westminster City Council stated that some 115,000 tons of refuse have to be disposed of each year by the council, and the cost of this work is a very heavy item of expense. The committee recommended that, as the question is one which affects all the districts of London, a conference of representatives of the Corporation of London and of the metropolitan borough councils should be convened to consider the whole question.

MAKERS' ACTIVITIES.

During the past twelve months Messrs. Meldrums, Limited, of Timperley, near Manchester, have completed a new four-cell destructor, of their front-feed type, for the North Sydney Council. This destructor works in connection with a Lancashire boiler. They have also shipped to Penang, S.S., an extension to the existing destructor installation, which consists of one of their four-cell, top-feed type of plants. It is fitted with a special carcase-burning chamber, and the contract included the necessary platforms and containing building. The plant is equipped with their simplex patent regenerator, and the air supply is provided by means of Sturtevant fans driven by enclosed engines. The boiler is a Babcock & Wilcox patent water-tube type, of 1,470 sq. ft. heating surface. They have also in hand, subject to the Local Government Board approval, municipal destructors for the Sidmouth,

Finchley and Felixstowe councils. The Sidmouth destructor is to be placed at the gasworks, which will provide a useful outlet for the steam. They are also engaged on a three-cell, front-feed destructor for the Marrickville Council, Sydney. The above-mentioned work is in addition to a large number of destructors of smaller type supplied for hospitals, asylums and sanatoriums.

Messrs. Manlove, Alliott & Co., Limited, of Nottingham, have, during the year 1914, been engaged on the erection of a number of refuse destructors, the most important of which were plants for Cleethorpes, Burton-on-Trent, and Kirkby-in-Ashfield. The Cleethorpes plant, which is now practically completed, consists generally of four "cells" or furnaces arranged in two units, each of two cells on the continuous grate principle. Each unit is complete with a water-tube boiler and combustion chamber, and the cells are all provided with drying hearths, and are arranged for back hand feed. The two boilers—one for each unit—are of the Babcock & Wilcox water-tube type, having a heating surface of 1,186 sq. ft. Forced draught is provided by means of a direct steam-driven fan, and steam jets have also been provided. A striking example of the sound construction and durability of Manlove, Alliott & Co.'s destructor plants is to be found in the fact that the plant they are now erecting at Burton-on-Trent is a reconstruction and extension of their existing plant which was built by them a wash-of a century ago. Incidentally it may be mentioned here that several destructor plants which were built by this firm between thirty-five and forty years ago are still working with satisfactory results. The new plant now in course of erection at Burton-on-Trent consists of four cells, arranged in pairs, on the continuous principle, with combustion chamber and Babcock & Wilcox water-tube boiler, having a heating surface of 735 sq. ft. Forced draught is provided by means of a fan and steam jets. The steam generated from the burning of the refuse will be utilised for electric lighting and for driving a clinker plant, in addition to providing steam for the needs of the destructor itself. The plant at Kirkby-in-Ashfield will consist of two cells, combustion chamber, and Babcock & Wilcox water-tube boiler. The cells are arranged for back hand feed. A fan and steam jets provide forced draught, and an air heater will be included for the purpose of heating the air for forced draught. A large number of smaller furnaces, or "incinerators," have also been supplied during the year to the War Office, the Admiralty, and numerous institutions such as infirmaries, hospitals and asylums.

Messrs. J. & E. Hall, Limited, of London and Dartford, state that during the past year they have supplied many of their lorries to various councils and corporations, including the Sheffield Corporation, two wagons making their fleet of "Hallfords" up to six; and the Kent County Council, six wagons making their fleet of "Hallfords" up to ten. In the case of these two public bodies they have received further repeat orders to replace their fleet of "Hallford" wagons, owing to their former vehicles having been impressed by the War Office for use with the Expeditionary Force. Among other corporations and councils whose "Hallford" wagons have been impressed by the War Office are the county of Southampton and the Wood-bridge Rural District Council, and in each case repeat orders to replace them have been received. The wagons supplied to the various councils are used for a variety of purposes, and it is not possible to indicate those that use them for refuse purposes only. It is now becoming a practice with the various councils to have interchangeable bodies, to enable a single wagon to be used for a variety of purposes, such as street watering, refuse collection, and the cartage of road materials.

The Eagle Engineering Company, Limited, of Warwick, have been fully employed during the past twelve months making both horse-drawn and tractor-drawn wagons for the removal of refuse, and they have also made a number of light steel tipping bodies for motors for the same purpose.

From a general statement of the activities during the past twelvemonth of the Patent Lightning Crusher Company, Limited, it appears that their system of disposal of house refuse has been adopted in Scotland, where the Corporation of Glasgow has erected at their Partick Works a double-unit plant of their patent lightning dust manipulators, and the Urban District Council of St. Andrews, in Fifeshire, has accepted their tender for the erection of a single-unit plant. In the South the Corporation of Hove, Sussex, after a test with one of these machines extending over a period of twelve months, has passed a vote approving of the plant being quadrupled. In the Colonies an offer for the erection of a single-unit in South Africa has been accepted, and a very favourable proposal for the erection of a plant in Australia has been received. These machines have undergone several improvements, and the cost of working has been considerably reduced.

Another branch of the business of this firm in which municipal authorities are interested is being rapidly developed—viz., the reduction of materials for road-making. In this line the Kent County Council has erected one of their machines for the crushing of shingle, the Hornsey Corporation has installed one for the reduction of their destructor clinker for road-making, while the Liverpool Corporation has erected one for a similar purpose, and the County Borough of West Ham has adopted the use of the machine for the reduction of gravel.

Messrs. Hughes & Stirling report that during the past year they have completed the following destructor installations:—

(1) A two-cell, front-fed "Sterling" destructor and Cornish boiler, complete with buildings and chimney, for the Farnborough Urban District Council. This plant supplies steam to the adjoining sewage pumping station.

(2) A three-cell, back fed "Sterling" destructor, with regenerator and B. & W. boiler, 2,030 sq. ft. H.S., with superheater, forced draught and ventilating plant, steam mains and feed pump, for the Pembroke (Dublin) Urban District Council. This plant supplies steam to the electricity works and has given very efficient results.

(3) A two-cell, back fed "Sterling" destructor, with Cornish boiler, complete with buildings and chimney, supplying steam for sewage pumping and disinfecting, for Horsforth Urban District Council.

(4) A two-cell, top-fed destructor of special "Sterling" design, connected to existing large "Sterling" W.T. boiler, to be used for factory power and heating steam at the Diamond Match Works, Liverpool. They are just now completing a plant for the Teddington Urban District Council at the sewage pumping station. The destructor plant comprises two two-cell, front-fed "Sterling" units, together with regenerator and two Lancashire boilers each 20 ft. by 7 ft. 6 in., the steam to be used for sewage pumping. For the Corporation of Widnes the firm have just commenced the erection of a complete installation, comprising a three-grate, back-fed "Sterling" destructor, with Cornish boiler, accessories, buildings and chimney, clinker crusher and screen, mortar mill, and a complete tar-macadam plant.

Important contracts are in hand for the Corporation of Luton and the Royal Borough of Sutton Coldfield. For the former the plant con-

sists of six "Sterling" back-fed cells, with a Babcock & Wilcox boiler, having 1,450 sq. ft. of H.S., with building, flues and accessory machinery. This plant, which will form an extension of the existing plant at the sewage pumping works at Luton, will be of somewhat similar design and arrangement to the plant erected by them for the city of Bath in 1913, which gives great satisfaction. The installation for Sutton Coldfield, abroad, well advanced, is an important one, comprising three "Sterling" back-fed cells, regenerator, Babcock & Wilcox boiler of 1,900 sq. ft. H.S., superheater, accessories, with buildings, chimney, steam main, &c. The site adjoins the borough electricity works, and the steam will be fully utilised for electrical purposes.

Abroad it has not been a busy year, but a complete installation has been completed for the city of Berkeley, California, U.S.A., comprising a three-cell, top-fed "Sterling" destructor, with regenerator and water-tube boiler, with buildings and chimney. Small hoppers above each cell are filled by means of a grab bucket and crane. The hoppers, at normal rate position and discharge their contents into the cell by means of hydraulic rams controlled from the clinkering floor. During the official tests, refuse was burned containing 63 per cent. and 48½ per cent. of moisture, the evaporation per pound of refuse dry-fired being 6 and 1·01 lb. respectively.

For the city of Columbus, Ohio, U.S.A., a two-cell, top-fed "Sterling" destructor is now being erected at the [illegible] station.

SEWERAGE AND SEWAGE DISPOSAL.

In dealing with the subject of sewage disposal in these pages during recent years we seem to remember having made the statement that the problem had been solved in principle, and that future developments would consist mainly of improvements in details. This naturally referred to the biological principle. Readers of this period during the past year, bearing in mind the several new methods of treatment which have come to the front, may consider that our attempt at prophecy has failed; but we think that, up to the present, it is quite correct to state that the new methods of treatment, about which so much has been written during recent months, are actually biological methods, and are merely developments in the application of the biological principle. Disposal by dilution, when properly carried out, is simply the utilisation of bacterial action in thoroughly oxygenated water, the oxygen necessary for the process being taken from the store of dissolved oxygen contained in the water and derived from the atmosphere. Aeration of sewage in tanks, which has been so much discussed during the past few months, is, again, simply a method of augmenting by artificial means the supply of oxygen, and thus accelerating the process of oxidation of the organic impurities. It used to be held by certain experts that some form of anaerobic preliminary treatment, involving putrefaction or septic action, was an essential stage in the process of sewage disposal; but we contended at the time that putrefaction, being the antithesis of purification, ought not to be considered as essential, and that oxidation alone should be the ultimate aim of all efforts to improve the methods of disposal. Since that time we have noted statements to the effect that sewage in a septic condition is less easily purified by filtration than when it is in a fresh state. Further, most improvements in the design of tanks have been in the direction of preventing, or reducing, the extent to which the sewage is subjected to septic action, and the latest developments indicate the possibility of dealing with both sewage and sludge by purely aerobic processes. For these reasons we believe that the improvements in methods of treatment which have been the subject of experimental work and discussion during the past year are in the right direction, and that they will ultimately result in the introduction of methods which will prove not only more efficient but more economical than the systems at present in general use.

DISPOSAL BY DILUTION.

One of the most important events of the past year in connection with sewage disposal was the publication of the final and complete report of the Metropolitan Sewerage Commission of New York. Interim reports had been issued separately from time to time, and were dealt with in these columns, and the chief point we desire to refer to here is that, after the most elaborate and painstaking investigations, the commission were of the opinion that the sewage of New York could be satisfactorily treated by dilution in the waters of the harbour, and in the bay around the harbour, if a certain proportion of the impurities were removed, and that this could be effected by tank treatment alone. From a perusal of the report, it is evident that the discharge for many years past into New York Harbour of the sewage of the city in a crude state resulted in the deposition in the harbour of large quantities of sewage matters in suspension, and that these depleted the water of the harbour of its dissolved oxygen to such an extent that the remainder was insufficient for the oxidation of the organic impurities. Once this state of affairs was reached the conditions of the harbour rapidly became worse and worse, and a little study of the possibilities of such a state of affairs renders it quite easy to comprehend the existing conditions of the harbour as described in the report. The important fact to note is that the conclusions arrived at indicate that if only the solids in suspension were removed, the liquid portion of the sewage could be satisfactorily treated by dilution, without causing a nuisance. The methods to be adopted for the removal of the suspended matters varied from simple grit chambers and screens to complete chemical precipitation, according to the amount of solids to be removed, and naturally the greater the efficiency of the process the greater the amount of sludge to be dealt with.

It may be noted here that in a preliminary report upon the disposal of the sewage of Chicago by a committee of three experts, two of whom were British engineers, it was stated that the minimum requirement should be the removal of the suspended solids by screens and settling basins. Thus it is evident that we were on the safe side when we suggested, in discussing the Eighth Report of the Royal Commission on Sewage Disposal, that it was very unlikely that, even under the best conditions, the discharge of crude sewage would be allowed without some form of preliminary treatment. At the same time, the experience gained from the work of the Royal Commission, as described in the Eighth Report and its Appendix, is being applied in several cases in this country, and there is reason to anticipate that much good work in abating nuisances from the discharge of crude sewage into rivers can be done at the expenditure of much smaller sums than would otherwise have been required.

PRELIMINARY TREATMENT.

The adoption of disposal by dilution under the conditions mentioned above tends to direct the attention of engineers to improved methods of tank treatment, and especially to those types in which the sewage is not allowed to become septic, but is maintained in as fresh a condition as possible. Some engineers are designing tanks on novel lines of their own, but there are several

patented forms of preliminary treatment, which have been described in our pages during the past year. Among these may be mentioned the "Separator," in use at Stone, Staffordshire (*vide* The Surveyor, January 9, 1914), and the "Field-house" tank installed at Leyton, Essex (*vide* The Surveyor, July 3, 1914). Both of these tanks have for their special object the maximum efficiency in the removal of solids in suspension, and this is attained chiefly by great reduction of velocity at the outlets. Incidentally, they also tend to prevent the creation of nuisance from smell by maintaining the sewage in as fresh a condition as possible, but no claim is made for any special advantage in the matter of sludge disposal beyond the provision of exceptional facilities for the removal of sludge.

On the other hand, a third type of tank, the "Imhoff," not only prevents the sewage from becoming septic, but it is claimed that the sludge itself does not produce any unpleasant odours, and is much more easily dried than ordinary sludge. This is stated to be due to the fact that the portion of the tank through which the sewage flows and leaves behind its suspended solids is completely separated from that portion in which the sludge accumulates; and that, under these conditions, the action which takes place in the sludge compartment does not produce the evil-smelling gases which are the usual causes of a nuisance. These tanks have been described in detail on previous occasions, but, so far as we are aware, there are only one or two in operation in this country up to the present. In America, however, as we have pointed out several times, this type of tank has been adopted in many places; we believe that something like one hundred are already in actual use, and are known there as "two-storied" tanks, to distinguish them from ordinary septic, or sedimentation, "one-story" tanks. One of the main features of the "Imhoff" tank is its great depth, varying from 20 ft. to 30 ft., as a rule.

This factor of depths undoubtedly has considerable effect upon the sludge, and may be very largely the cause of the favourable condition for further treatment of the sludge when it is drawn off. This view is supported by the results obtained in experiments with deep tanks, varying from 17 ft. to 30 ft. in depth, which were carried out during 1913 at the Lawrence Experiment Station of the Massachusetts State Board of Health, U.S.A., and described in detail in the forty-fifth annual report of the board. It is there stated that the investigations were "made with sewages of various kinds, and had for their chief object the determination of the physical character and the odour of the sludge when drawn from such tanks after varying periods of storage and decomposition. It was shown by these studies that the deeper the tank, other things being equal, the less the odour of the sludge and the more easily it is handled, drained and dried, owing to improvement in its physical character." It should be noted, however, that in these experiments the deep tanks were filled with sludge taken from other tanks, and further quantities of similar sludge were added to the tanks from time to time; so that, while the process was not exactly the same as in a complete "Imhoff" tank, it is claimed that the conditions were similar, the sludge being subjected to storage and decomposition action under gradually increasing pressure as it worked its way to the bottom of the tank.

In this connection it may be observed that, as the patentee is a German, the question of payment of royalties has already cropped up, and the Board of Trade, in reply to a communication from Messrs. Strachan & Weekes, consulting engineers, of Westminster, have intimated that if any local authority desire to use the apparatus, they should make application under the rules for that purpose, when the board could consider the advisability of suspending the patent in their favour and of fixing such royalty as might be thought reasonable. For our part, we hope by this time next year to have particulars of the results obtained with the "Imhoff" tank which has been constructed at Withington for the Manchester Rivers Department.

Aeration of Sewage.

The developments which have taken place during the past year in this method of treatment are extremely interesting. In our Special Issue of January 30, 1914, we commented upon the earlier experiments carried out by the officials of the Massachusetts State Board of Health by blowing air through sewage contained in a tank fitted with slate slabs placed 1 in. apart, and we then pointed out that it was not clear whether the slabs were placed horizontally or vertically. From a later report it now appears that at first they were used in a horizontal position, but later they were fixed vertically, and thus, as we suggested, may be compared with the "colloidors" in some of the Travis hydrolytic tanks.

These experiments were not the first undertaken in connection with artificial aëration. Some earlier work was referred to in the same special article of January 30, 1914; but the whole history of past investigations into this subject was well summarised by Mr. Edward Ardern, M.Sc., in the paper which he read at the last annual general meeting of the Association of Managers of Sewage Disposal Works (The Surveyor, December 18, 1914). Although most of the experimental work has been on the laboratory scale, it should be noted that the investigations at Salford, as described in the paper by Mr. W. H. Duckworth, F.C.S., which we printed in these pages on December 11th last, were made with about 75,000 gallons of sewage per day, and may thus be considered as on a practical scale. As the results obtained confirmed the results obtained by Mr. Ardern at Manchester, there is no question that the principle has been proved, and it only remains to ascertain the minimum volume of air required to secure efficient results under normal working conditions. This, however, involves much work over a considerable period to arrive at the most suitable form of construction of the tanks themselves and the most efficient method of introducing the air into the sewage in such a manner that it shall not only allow the liquid to take up the maximum amount of oxygen, but that it shall ensure the thorough mixing of the "activated" sludge with the sewage. Indeed, the important part in the process played by the sludge is the most interesting feature of this method of sewage treatment.

It is this which forms such a distinct advance upon our previous knowledge of the subject, and for which we are indebted to the Manchester workers. It now appears that the sludge, which has heretofore always been considered the bugbear of the sewage works manager, is, or will be, actually his best friend, as without the sludge the results recorded could not have been attained. Further, the effect of the thorough aëration which is needed to render the sludge "activated" is such that the final disposal of the residue can be carried out with great ease and without creating a nuisance. If it were not that we now have trustworthy records of results obtained in several places independently, and some on a practical scale, we should be inclined to consider the claims made for this process as extravagant. It is true that we still lack definite details with regard to the cost of operation, but it will be advisable to wait for these until the form of the tanks and the methods of applying the air have been perfected.

Sludge Disposal.

Much work in the improvement of sludge disposal systems has been done in a quiet way during the past year. To our mind the experiments in

connection with the aeration of sewage have given the best promising prospects of a satisfactory solution of this difficult problem. To find the sludge a necessary adjunct of sewage purification, and its disposal thereby rendered much less difficult, was quite unexpected. It is evident that future developments in this direction will proceed in conjunction with those in connection with the aëration of sewage.

Apart from this, reference must be made to the system described by Mr. J. D. Watson, M.Inst.C.E., in his presidential address to the Institute of Sanitary Engineers at the beginning of last year (THE SURVEYOR, January 9, 1914). In this case the addition of yeast to the sludge facilitated the separation of the liquid from the solid portion. Somewhat similar results appear to have been attained by allowing the sludge to decompose at the bottom of deep tanks, as described above under the heading "Preliminary Treatment," reference to which will show that in this instance the sludge was separated from the crude sewage. The same system (of separation) was adopted in dealing with the sludge at Birmingham, as described in the very interesting paper read before the Birmingham section of the Society of Chemical Industry by Mr. F. R. O'Shaughnessy, F.I.C. (THE SURVEYOR, March 6, 1914). It was there shown that the separation and further digestion of the sludge was estimated to reduce the time required for maturing by five or six weeks.

Among the latest processes for the utilisation of sludge is that known as the "S.O.S." system, which has been adopted at Wimbledon recently. The sludge, after being pressed, is subjected to a process of destructive distillation, and the residue, consisting largely of fine carbon, is used in the place of lime for the precipitation of the solids in the sewage. We believe we are correct in saying that it has a value for other purposes as well, and further particulars of the results obtained should be available in due course, and will prove interesting.

THE ROLE OF INSECTS IN SEWAGE DISPOSAL.

In our Special Issue last year we referred to the investigations carried out by Mr. H. D. Bell, manager and chemist at the sewage works of Stratford-on-Avon, with reference to the effect of *Podura* in his filters. At that time we observed that it was not clear whether the insect in question was correctly named. Further information on the subject was published in these pages recently (THE SURVEYOR, December 18, 1914), and it is interesting to note from the particulars supplied by Mr. J. W. Haigh Johnson, B.SC., F.L.S., chemical biologist to the West Riding of Yorkshire Rivers Board, that it does not even belong to the genus *Podura*, but to the closely allied one of *Achorutes*, and that its proper scientific title is *Achorutes viaticus*. The question of its right name may not be considered of great importance to sewage works managers, but it is important to know that it usually feeds upon the slime which develops on the material of sewage filters. This accounts for the improvement which occurred when Mr. Bell placed considerable numbers of this insect on some of his filters at Stratford-on-Avon. We think this information should be made known to all sewage works managers, as it is evident that it would be well worth while for them to collect all the *Achorutes viaticus*, otherwise the tiny bluish-black "maggot" which they notice in effluent channels and chambers, humus tanks, and elsewhere on their works, and carefully place them on the top of their filters, especially on those which are in any way clogged.

CAMP SANITATION.

One effect of the war is seen in the admirable articles under this heading which have been contributed to this journal by Mr. G. B. Hartfree, engineer and surveyor to the Whit. Haunts, Urban District Council. His description of latrines, closets and urinals has undoubtedly been of distinct service to many of our readers who have had to provide accommodation for the large numbers of soldiers who have been in camp during the last few months.

ELECTROLYTIC SEWAGE DISPOSAL.

The utilisation of electricity as a factor in the treatment of sewage has at various times exerted a fascination upon the minds of a number of people who have endeavoured to prove its value in practical application. We have dealt with several attempts in this direction in recent years, and, although the published results have always appeared hopeful, the system has by no means found general application. The latest of these schemes was discussed in these pages recently (THE SURVEYOR, October 16, 1914), and we then stated that we were inclined to agree with the editorial comment of our contemporary *Engineering Record*, from whose pages we obtained a description of the system, that engineers will probably not receive the results of this experiment with quite as much enthusiasm as is contained in the report in question. Since then we have noticed a further discussion in the same journal and a letter from Mr. Earle B. Phelps, Professor of Chemistry in the United States Public Health Service at Washington, in which this eminent expert describes an experiment made in his laboratory with Washington sewage upon exactly similar lines as the above-mentioned system. The nett result was the expression of opinion by Prof. Phelps that "it seems, therefore, that, except for the slight additional advantage of a vigorous mechanical agitation which is a well-known coagulating force, the results of the 'electrolytic' treatment can be accomplished without the electrolytic feature." Further comment is unnecessary.

SUGAR FACTORY WASTES.

In view of the fact that one large sugar factory is already in operation in this country, and others are projected, a description in *Engineering Record*, of October 24th last, of some works specially designed for the disposal of wastes from a sugar factory in California is of interest, and may prove of value to some of our readers. The waste liquids from these factories contain exceptionally large amounts of organic matter, which is apt to become foul rapidly and give off extremely disagreeable odours. The system adopted in the case mentioned consisted of screening by means of a rotary screen and intermittent downward filtration on sand filters. This method is stated to have been entirely satisfactory, and if this type of filter should not be suitable for the conditions in this country it should not be difficult to adapt some type of filter already in general use here. It is fairly evident that everything should be done to prevent the setting up of putrefaction in such liquids, and there would appear to be an opening for experiments with the latest methods of treatment by aëration. Power for providing the necessary volume of air would be always available in such a factory at very little cost, and a further factor in favour of the adoption of such a system is the limited period, three to four months in each year, during which a sugar factory is in operation. It would, however, be necessary to devise some means of producing the required quantity of "activated" sludge in advance, so as to be in a position to put the tanks into proper operation at the commencement of each season, instead of waiting for the "activated" sludge to form in the ordinary way.

DESCRIPTIONS OF WORKS.

The engineer in search of ideas, and the student, will find a perusal of the back numbers of this

journal for the past year particularly fruitful. A large number of excellent descriptions of works carried out, and records of results obtained, have appeared, mostly in the form of papers read at the various meetings of the Institution of Municipal and County Engineers. Among these we may mention descriptions of works at Worcester, Wakefield, Salisbury, Cleethorpes, Leeds and Sheffield. Many features of interest, including suggestions of how *not* to do things, may be found in these papers. Among the latter we may refer to one case at Wilton, mentioned in a paper by Mr. John H. Blizard, ASSOC.M.INST.C.E. (THE SURVEYOR, May 22, 1914). When carrying out the sewerage of Bemerton, near Salisbury Mr. Blizard arranged the sewers in such a manner that the sewage from the adjoining district of Wilton could be taken in by gravitation whenever it was found advisable to do so. Later, when the scheme of sewerage for Wilton was prepared by another engineer, it was decided to pump the sewage into the Bemerton sewers, in spite of the fact that Mr. Blizard pointed out at the Local Government Board inquiry that it could be discharged by gravitation. The scheme was, however, duly approved by the Local Government Board, and for several years the sewage of Wilton was pumped until some trouble arose from an excessive amount of leakage into the sewers. It then occurred to somebody that Mr. Blizard may have been right after all, and eventually he was instructed to deal with the matter, with the result that the sewage is now gravitating to Bemerton and the pumps are not required.

Among the papers referred to above there were two of exceptional interest and value which formed the subject-matter of two special supplements (THE SURVEYOR, February 27, and June 12, 1914). The first of these, by Mr. T. de Courcy Meade, M.INST.C.E., city surveyor of Manchester, described in detail, with numerous illustrations, "Twenty Years' Work in a Great City." The major portion of the paper was devoted to the new main drainage works then in course of construction, and the most interesting part was probably that which dealt with the defects observed, after careful inspection, in the work previously carried out, and the methods adopted to make good those defects and to prevent their recurrence in the future.

The second of these two special supplements was a description by Mr. E. J. Elford, M.INST.C.E., borough engineer of Southend-on-Sea, describing and illustrating the new main sewerage and sewage disposal works constructed for that town. In these works the special methods adopted in the construction of the two intercepting sewers, and the system of jointing the concrete tubes of which they were formed, are of exceptional interest. Other novel features of the scheme were the adoption of two Humphrey pumps, each capable of raising 198,000 gallons per hour against a head of 68 ft. for dealing with the storm water, and the use of a Stereophagus pump for the removal of accumulations of deposit from the invert of the pump well.

STANDARDISATION OF ANALYTICAL METHODS.

The lack of uniformity in the tests used in different sewage works is very unsatisfactory, as comparisons between the results obtained are apt to be misleading. An effort to remedy this defect is being made in America, and an elaborate report upon "Sewage Works Operation and Analytical Methods" has been prepared by a committee appointed for the purpose by the sanitary engineering section of the American Public Health Association. This report appeared in our issue of January 1st, and we hope that the appeal for co-operation by communicating their views will find a ready response from our engineers, chemists, biologists, and sewage works managers. We already derive much benefit from the many admirably presented records of sewage works operation published in America, and anything that can be done in this country to assist in making all tests uniform would be of considerable value to workers in both countries.

REVENUE FROM SEWAGE DISPOSAL.

There are few places where any income is derived from sewage, and among these Bradford, Yorks, probably stands easily first. Although the total cost of disposal in 1913 was £89,000, the sale of grease alone brought in £48,000, while the sludge residue, after the removal of the grease, was sold in large quantities as manure, being sent to France, Belgium, Florida, and even as far as India to tea gardens on the slopes of the Himalayas. The revenue derived from the sale of these by-products more than covers the cost of operation, so that, apart from capital charges, the sewage disposal works are self-supporting.

STREET LIGHTING.

Undoubtedly the feature which above all others marks out 1914 from its predecessors in connection with street lighting is that which is aptly conveyed by the ancient pseudo-paradox, *lucem a non lucendo*. Never before, since the modern art of street lighting was developed, have the streets in the eastern and some other British towns been reduced to so low a level of illumination the minimum compatible with a moderate degree of safety to traffic. The chief object of this has been to diminish the illumination of the sky by the light reflected from the ground, in order to facilitate the detection of hostile aeroplanes, and therefore the lighting of shop windows—which contributes no mean portion of the street lighting in business quarters—has also been cut down by order of the Government. Another purpose has been to render it difficult for enemy aircraft to recognise their whereabouts by the relative widths of the main roads, and for this reason in many cases the lamps have been lighted only on one side of the roadway. Various methods have been adopted in order to meet the requirements, such as lighting only a few of the street lamps, painting the upper and sometimes the lower portions of the globes, installing lights of lower candle-power, and so forth. The effect, in the opinion of some observers, has not always been a change for the worse: in particular, the abolition of the glaring outside lamps used by many shopkeepers has been an unmixed gain to the general public, and tradesmen have perforce learnt better ways of illuminating their shop windows than that of filling them with unscreened glaring lamps. But the dangers of the streets are undoubtedly greatly increased, and had it not happened that very many of the motor-'buses had been requisitioned for the front, as well as many private cars, the death-roll in London, at any rate, would have been abnormal.

SHORTAGE OF SUPPLIES.

Another way in which the war has affected street lighting is by cutting off the foreign supplies of gas mantles and arc-lamp carbons, the great bulk of which were imported from the Continent in peace time. Fortunately, considerable stocks were held in this country, and manufacturers of mantles will be able to meet the conditions, provided they can obtain an adequate supply of the rare earths necessary for their purpose. One carbon works, patriotically maintained for many years at a heavy loss, immediately experienced a torrent of rush orders, which had to give place to urgent Government demands. The scarcity of carbons has certainly restricted arc lighting in many cases, and in some

instances has led to the substitution of high candle-power incandescent electric lamps for arc lamps.

NEW LAMPS.

It so happened that the new half-watt lamp (which is described in our special article on Electricity Supply), which was put on the market in January, was admirably adapted to replace the arc lamp, and it has been installed by many street lighting authorities. No doubt its adoption has been appreciably accelerated by the stringency in the market for carbons. Its efficiency is not greater than that of the flame arc, but it has the advantage of requiring practically no attention. The cost of renewals is somewhat greater than the cost of carbons for trimming flame arc lamps, and apparently the latter is still the cheaper on the whole; but the life of the half-watt lamp is the determining factor, and this is not yet very precisely known. The guaranteed life was 1,000 hours, but in practice a life of 1,500 hours is said to be attained, and as the methods of manufacture improve, still longer lives may be expected, as well as a reduced first cost. The prospects are decidedly favourable to the newcomer.

The gas engineers also had a new lamp before them last year—namely, the Keith high-pressure silica lamp. This has been in course of development for some years, in the face of extraordinary difficulties, but in October, 1913, it was publicly demonstrated for the first time. Fresh difficulties cropped up, and the introduction of the lamp was further delayed, but in April last year Mr. George Keith announced at a meeting of gas engineers that the troubles had been overcome. The essential feature of the new lamp is the substitution of a small fused silica cup for the large glass globe, enclosing the mantle in a small chamber. The cup becomes red-hot, but suffers no injury—on the contrary, the high temperature burns off dirt which may be deposited on it, and cleaning is much less frequently required. One of the principal advantages of the device is the lessened cost of maintenance; the occurrence of a hole in the mantle does not necessitate an immediate renewal. The small size of the cup also gives greater latitude in the design of the lamp and reflector, and the efficiency of the lamp is higher than that of the ordinary high-pressure type, while the maintenance cost is said to be about half as much.

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The reduction of illumination has naturally had the effect of shutting down for the time high-pressure gas lighting in many places, and thus retarding the development of this branch of industry. It has also raised the question how the existing contracts for gas and electric lighting are to be dealt with. This, however, is being settled by agreement in a friendly spirit between the municipalities and companies concerned. The contractors for gas lighting are making reductions corresponding to the saving in gas, but point out that the cost of maintenance of the plant is not materially diminished, and therefore no allowance will be made on this score. The new scheme for lighting the City of London with gas and electricity in approximately equal proportions has been practically completed. In Manchester the electric lighting is being extended [illegible] miles of streets being included in the scheme; flame arcs will be used for the most part, but a proportion of half-watt lamps will be installed. The central suspension system is gaining in popularity. The Joint Committee of members of the Illuminating Engineering Society and the Institutions of Gas and Electrical Engineers which was appointed to draw up a model specification for street lighting, but came to a deadlock, is still considering the subject, and has not yet solved the problem.

TRAMWAYS.

The history of municipal tramways during the past year has not been marked by any very striking events. Good progress has been made, and with certain exceptions the returns have been highly satisfactory. The effect of the outbreak of war, however, has made itself felt towards the close of the year in the shape of reduced traffic receipts, and a number of extensions and new tramway construction schemes have been held up for the time being. There has not been manifested the slightest justification for the agitation from time to time worked up by certain newspapers against municipal tramways, on the fallacious ground that they are being superseded by the self-contained motor vehicle, in point of fact, nowhere except in London is there even a plausible basis for such a contention, and the conditions which obtain in the Metropolitan area are unique in the world. In the provinces the larger undertakings, and most of the smaller ones, have shown a satisfactory credit balance after making all allowances, and in some cases a very large surplus has been recorded.

METROPOLITAN TRAMWAYS.

Unfortunately, in the Metropolitan area the severity of the competition of the motor-omnibuses has had a disastrous effect upon the financial condition of the municipal tramways concerned. The huge system of the County Council, embracing over 148 miles of streets, showed a deficit of no less than £88,526 for the year ending March 31st, which had to be made good from the reserve fund, reducing the latter to £190,597, and no addition could be made to the renewals fund, which stands at £539,749. The tramways, of course, are heavily handicapped in the competition by the special statutory burdens imposed upon them and not upon the omnibus companies, [illegible] to which London is exposed, and the tramways in the great cities have been thriving; the problem, indeed, has been how to carry the [illegible] traffic [illegible] and [illegible] the [illegible] and [illegible] the [illegible] [illegible] into the country. The County Council estimates that, [illegible] the public [illegible] to the extent of £11 [illegible] per £100 of gross receipts of the tramways, the omnibuses contribute only £2 6s. If the latter were called upon to pay ¾d. per 'bus-mile for the road repairs necessitated by their heavy traffic, their contribution to the public funds would be increased to £7 per £100 of gross receipts, and the margin of receipt over expenses would be reduced from 0·38d. to 0·1d. per 'bus-mile. Moreover, the carrying capacity of the tramcars during the busy hours is far greater than that of the omnibuses, and the former provide protection from the weather. Fortunately for the tramways, on the outbreak of war an enormous number of motor-omnibuses was requisitioned by the Government for service at the Front, and heavy drafts have since been made upon them, while the whole output of the omnibus company's workshops is absorbed by the War Office, so that the tramways at present have an opportunity of repairing their losses. The council is seeking powers to expend nearly £250,000 sterling on tramway works.

PROVINCIAL TRAMWAYS.

The provincial towns are free from the competition

traffic that is offered a question which has reached an acute stage in Manchester and Liverpool, owing to the extreme congestion in the central areas. Manchester Corporation Tramways brought in a revenue of £925,310, and a net profit of £200,000, of which one-half was allotted to the rates. Over 200,000,000 passengers were carried, and a profit was made on the carriage of parcels. A new car with front exit has been introduced. Drastic measures are urgently necessary to cope with the traffic, and though the authorities hesitate to open the question of underground subways, it is stated by Mr. McElroy, the general manager, that rapid-transit facilities will have to be provided in the near future. A similar situation obtains in Liverpool, and the general manager, Mr. Mallins, who has introduced improved and larger types of car, proposes that a tunnel should be constructed under the river. A committee of the corporation was appointed in January to consider the question. Further proposals put forward by Mr. Mallins embrace the construction of tube railways aggregating 11 miles, and costing £5,500,000 sterling, the complete scheme involving the co-ordination of the whole of the existing transport systems on both sides of the river Mersey. The tramways carried 144,000,000 passengers, and contributed £100,000 to the rates, a record figure. The reserve fund was raised to more than £750,000 sterling. A proposal to undertake goods traffic from the docks was seriously considered, but would involve the contruction of new lines, as the existing tramways are utilised to the utmost.

Glasgow had a successful year, and was able to allot £53,892 to the "common good." Owing to the high charges of the insurance companies, the corporation has resolved to provide its own insurance fund against third-party risks, and is setting aside £31,000 a year for this purpose. The city holds a lease of the harbour tunnels, and proposes to run tramways through them to relieve the traffic over the bridges. A new type of car with front exit is under trial. The tramways carried 336,000,000 passengers, of whom no fewer than 211,000,000 paid halfpenny fares. Birmingham resolved upon extensions to cost £128,240, and experimented with first-class cars, which proved a failure. Bristol Corporation decided to promote a Bill to enable it to purchase the tramways, the option maturing in 1915. The cost will probably be £1,250,000 sterling. The Newcastle Corporation distinguished itself by allocating £18,000 to the rates, and borrowing £12,240 for new cars. Leeds paid £70,000 to the rates. Sheffield carried 105,000,000 passengers, and contributed over £30,000 to the rates. At Hastings the surface-contact system on the front, which has been giving trouble for years, was finally condemned by the Board of Trade, and as the corporation will not permit the overhead system to be used on this section, Stevens petrol-electric tramcars were adopted. These change over to the trolley system at the boundary of the section. There are now only two surface-contact systems in operation in this country—namely, at Wolverhampton and Lincoln. A curious situation arose at Chester over the purchase of the Colne and Trawden Light Railways by the corporation. The company asked for £85,000, the council offered £45,000, and the matter went to arbitration, when the respective figures put forward were £170,000 and £27,000. The arbitrator, who was not informed about the lower figures, awarded the company £92,830. Edinburgh and Halifax are each proposing to spend over £160,000 on tramway construction.

RAILLESS ELECTRIC TRACTION AND MOTOR 'BUSES.

The popularity of the railless system seems to be increasing. Extensions were carried out by the Bradford, Keighley, Leeds, York, and Reading Councils, new schemes were adopted at Walsall, Aberdare, and Nelson, and one was inaugurated at Ramsbottom. Remarkably low working costs have been published. Brighton and Hove are still arguing about the system to adopt for their joint scheme. Brighton wants an underrunning system on account of the trolley tramways, while Hove prefers the over-running type, and has had a mile of roadway equipped on that system for demonstration purposes. Apparently the question will have to be settled by arbitration. A good deal of attention is also being given to motor omnibuses by municipal tramway managers as feeders to their systems. Edinburgh tried six, but gave up the experiment after incurring a considerable loss. Sheffield, however, obtained a revenue of £9,128 from motor 'buses, and recorded a surplus of £1,271. At Halifax a loss was shown. Birmingham, Oldham, Rotherham, Warrington, and Wolverhampton are also using motor omnibuses. Southend, York, and South Shields are trying Edison electric battery 'buses—a fact which carries us back to old times, for the attempts to run battery 'buses and tramcars were many and various some twenty years ago—and costly too. But the modern electric 'bus is very different from its ancient forerunner, and as a matter of fact the Brighton Corporation has had a number of them in use for some time. Coventry's 'buses were carried off by the War Office. At Oxford the corporation has maintained for years a controversy with the local tramway company, which wished to convert its horse tramways to the trolley system, while the council demanded the conduit or surface contacts. The knot has been cut by the council's agreeing to a Bill promoted by the company, by which the latter is authorised to run motor 'buses. Birmingham Corporation has been contemplating the purchase of the whole of the plant of the Birmingham and Midland Motor Omnibus Company for £34,000.

ELECTRIC AUTOMOBILES.

We have already mentioned some instances of the use of electric battery vehicles by municipalities. A strong impetus was given to this movement by the formation of the Electric Vehicle Committee of the Incorporated Municipal Electrical Association in 1913, and during the past year the committee has been actively engaged in forwarding it, mainly in the interests of electricity supply. The movement, however, affects the traction and other departments also, and may fitly be included under this heading. The committee rightly began by organising facilities for charging the batteries of electric vehicles, and continued this policy by specifying standards for charging plugs, voltages, and so forth. It also urged municipal departments to use these vehicles whenever possible, and battery vans have been obtained for refuse collection by the Corporations of Glasgow, Birmingham, and Marylebone. Electric tower wagons have been purchased by Ilford Urban District Council and Belfast City Council for work on the trolley wires, and the London Fire Brigade has fifteen "electrics" in use as escape vans and motor turntable ladders, as well as some petrol-electric vehicles.

The requisitioning of petrol vehicles by the War Office naturally sent up the demand for electric vehicles, and there is certainly a bright future before them. Fifteen municipalities are using them, and a large number of electricity works have made arrangements for charging the batteries. The committee is endeavouring to induce all suppliers to make a uniform price of 1d. a unit for charging, at times other than during the "peak" load. Users generally report very favourably as to their reliability and economy in

comparison with either horse-drawn or petrol vehicles.

MISCELLANEOUS ITEMS.

The "Pay-as-you-enter" principle, at first thought to be unsuitable for conditions in this country, has established itself in several towns. Aberdeen, in particular, has found it very satisfactory, and Blackpool has recently adopted it for top-deck passengers, the advantage being that the conductor need not leave the lower deck. Passenger meters are being tried for top-deck passengers at Sheffield. A universal penny fare has proved satisfactory at South Shields, but this, of course, is only possible where the system is not of an extended character.

The London County Council was recommended by the General Purposes Committee to concur in the view of the Select Committee on Motor Traffic—that in all Metropolitan traffic questions Parliament should be advised by a special traffic department, combining the duties of the various existing authorities that deal with this subject. The Municipal Tramways Association also adopted this policy. The position of motor-omnibus traffic with regard to the maintenance of roads was further considered by Parliament, and a charge of ⅜d. per 'bus-mile was imposed in connection with several Bills, so that it would seem that the principle of making the omnibus companies pay for the use of the roads has been definitely adopted, though it has not received universal application. It necessarily reacts upon railless trolley systems, which are subject to the same payment.

The subject of rail-corrugation was discussed by Mr. S. Sellon in a paper read before the Institution of Civil Engineers in February, when the author ascribed the trouble to the use of steel not hard enough or tough enough for its work. It will be remarked that this was the view supported by THE SURVEYOR in 1907.

A remarkable paper on "Town Planning in Relation to Tramways" was read by Mr. J. A. Brodie, city engineer of Liverpool, before the Tramway Congress. The author advocated a more liberal policy in laying out new and important roads, suggesting a minimum width of 80 ft. for any main thoroughfare leading to the centre of the town, and 120 ft. if possible. Having the courage of his convictions, the author had constructed such roads in Liverpool, with the tramways in the middle. High speeds he regarded as essential to the success of tramways in the future, and these could be attained by separating the tramway from the roadway, while the cost of the 120-ft. road and a tramway laid on sleepers was not greater than that of the 80-ft. road with a paved tramway track. He thought that by this means the construction of subways or tubes could be avoided. It is evident that in the north the evolution of the tramway is not regarded as having reached finality, and that the managers and engineers have undiminished faith in its future.

WATER SUPPLY.

In almost every branch it will be found that water engineering practice has changed materially during the last few years, and that the methods which were generally accepted at the end of the last century have been altered beyond all recognition. During the past year much progress has been made, and the object of the present review will be to indicate some of the changes taking place rather than to describe or enumerate the works constructed or designed during that period.

Whether we consider sources of supply, methods of storage, pumping, purification, distribution, or general construction, we note great changes due to altered conditions, to the advance of knowledge, and last, but not least, to the energy and enterprise of the engineer. Who, a few years ago, would have taken into account in designing a waterworks that water can be lifted against a head of 1,800 ft. by centrifugal pumps, or would have had any conception of an appliance such as the Humphrey pump? What manufacturer twelve months ago could have hoped to have been suddenly free from the powerful German competition? Possibly the increased use of reinforced concrete, the improvements in internal combustion engines, the economy to be effected by the prevention of waste and leakages, the enormous increase in the use of steel water-mains, the combination of districts, or the increased use of water power and electricity might have been anticipated by thoughtful men; but it is improbable that any one could have foretold even a few years ago the extraordinary progress in methods of construction, the rapidity with which great works can now be carried out, and the manner in which works of water supply are being carried out in all parts of the world; neither is it possible for us to foresee the results of the work which is at present going forward. One thing, however, is evident—that in such a time of change and progress it is necessary to learn daily what is taking place around us.

SOURCES OF SUPPLY.

Although the principle of obtaining the purest water possible still holds good, the modern tendency, speaking generally, is to obtain water from the natural source of supply to the district without going further afield than is absolutely necessary. We see the adoption of this principle chiefly abroad, but we are not without important examples in this country. The instance of London has been so often referred to in these pages that it is unnecessary to do more than mention it. We drew attention in the early part of the year to the fact that the Coventry City Council had adopted proposals for reclaiming the Whitley Waterworks, which had been out of use for five years owing to the water being polluted. It was then proposed to sterilise this polluted water, it being estimated that an annual saving of £3,285 would thereby be effected. It would be possible to mention a number of other instances where a similar policy has been adopted. On the other hand, owing to the lack of knowledge among the general public, it is generally impolitic to lay too much stress upon the character of the raw water. There are, however, in this country a large number of supplies which in their raw condition would be quite unsuitable for drinking purposes, and the fact that they are being treated and made fit for human consumption renders such waters safer than purer waters would be, only that such waters may easily be subjected to accidental contamination, and if thus polluted would receive no purification at the works.

Undoubtedly, the safest supply is the purified supply. Neither must it be imagined that the water which is obtained at great cost from upland gathering grounds may not, under certain conditions, give serious trouble. We had such an instance in the past year in the case of Nottingham, where a very serious state of affairs arose in connection with the Derwent Valley supply. Almost at the start there were complaints as to the colour and taste of the water, and the Nottingham City Water Committee reported to the effect that if the supply from the Derwent Valley works was to be continued the whole of the wrought-iron pipes, cylinders and boilers then in use for hot water domestic supplies would have to be replaced by lead and copper piping and fittings. It appeared that the water at that time was of such a quality that, though pure enough from the health point of view, it was likely to be extremely troublesome. It will be remembered that some years ago Sheffield had the same experience. Such instances as Nottingham go to

prove that the advantages of going far afield for water are not always as great as is supposed.

There are various reasons why such water often has to be treated. Again, in many places it is impossible to obtain a perfectly pure supply without treatment. All over the world it is certainly becoming the general practice to use the supply nearest at hand, and although much money will undoubtedly still be spent on long pipe lines, reservoirs and so forth in order to obtain a supply of exceptional purity, more elaborate purification works will in many cases, probably in the majority of cases, act as an efficient substitute.

WATER TREATMENT.

"River and Canal Water Purified for Town Supplies and Industrial Purposes" is the heading of an advertisement issued by one of the great manufacturers of water purification plant. Gradually even the layman must be realising that a great change has come over our water engineering. It cannot be said that the science of water treatment has reached its final stage. It is possible to obtain results required by various methods, but, though we are still in the interesting period of rapid advancement, when methods of all kinds are on trial, and wherein all concerned find ample outlets for their energy and fresh problems upon which to employ their best united efforts, we have at any rate reached the stage when great economy and absolute safety are to be obtained by the adoption of new methods.

In reviewing the work of water treatment, therefore, it is clear that we have to deal with many different methods, all of which are finding useful application at the present time.

Purification by storage is best exemplified by the works of the Metropolitan Water Board. This process is at work, recognised or unrecognised, in many other places. Occasionally the principle is advocated for new schemes, but from its nature it can only be adopted under certain conditions. The changes effected by storage depend entirely upon the character of the water. A good water from upland sources, deep wells, or springs will not improve by storage; on the contrary, such storage is liable to cause deterioration; but for waters derived from rivers or shallow wells containing organisms storage has been found to be useful for the reason that, as shown by experiment, pathogenic germs tend to disappear. There are, however, various possibilities of trouble and a certainty of expense which limit the usefulness of that method.

Aëration, being useful in removing or lessening odours and colours, for the oxidation of iron in solution, or of nitrogenous matters, is a process which forms a very important step in the purification of water at most of our large works at the present time. It is generally admittedly desirable. Another process, possibly the most important part of the majority of methods of water treatment, is sedimentation, either natural or assisted. We find that by the addition of various chemicals changes of many kinds are effected and a deposit results, as for instance in the case where lime solution is added to hard water.

To review the many processes in which this occurs is unnecessary, and it will be sufficient to state that it is in such chemical treatment of the water that some of the chief advances made during recent years are due, and that the work of the past year shows various new applications of the process. Natural sedimentation is also largely used. It certainly forms an important part in the method of purification by storage, while it may be said to be the principle upon which the roughing or preliminary filter is based, the chief application of which is to be seen in the Puech Chabal system, which is in use at Sunbury-on-Thames, Bamford, Derbyshire, and at very many other places which have been mentioned from time to time in these pages. The extensive use of the Puech Chabal filter is one of the noteworthy features of the present time, its principle being multiple filtration. Settlement and coagulation, speaking generally, do not form a complete purification system because the length of time required for the water to be cleared in this manner is too great; thus the process is generally used as a preliminary to filtration. In the science of filtration there have been great developments.

FILTRATION.

It is not very long since the open sand filter was the chief means of water purification throughout the world, and although it has been superseded at a great many places by the mechanical filter, it is still one of the chief methods. The greater economy of using mechanical filters is, however, evident. In a country like England, where land is valuable, the advantages are peculiarly great; thus the use of mechanical filters, combined with apparatus for adding suitable chemical solutions, has steadily advanced. Installations dealing with the largest supplies in this country and abroad have been noted from time to time in these pages, and it will be seen from information given elsewhere as to a number of plants of this description installed during the year 1914 that there can be no doubt as to the universal acceptance of the mechanical filter. Further, it may be said that the method includes the treatment of all waters to any required degree. The removal of discoloration, iron acidity, plumbo-solvency, and corrosive qualities may be ensured. The cost of construction, upkeep, and the area of the works are reduced to a minimum. The rate of filtration is higher, better control is afforded, contamination is prevented, and the irregularities of working common to all slow sand filters are avoided. Hence it is not at all surprising that the mechanical filter bids fair in time to supersede the slow sand filter entirely.

GREAT INSTALLATIONS OF MECHANICAL FILTERS.

Probably the most important installation of mechanical filters during the past year is that of St. Louis, where a plant capable of treating 160,000,000 gallons a day has been under construction. At Baltimore there is an installation with a capacity of 128,000,000 gallons per day. In this country we have already seen towns such as Sheffield and Huddersfield adopting the system, and it is noteworthy that at Huddersfield a further extension of the works has been made during the past year by the addition of more mechanical filters capable of dealing with 4,500,000 gallons of water per day, while filters to deal with another 1,200,000 gallons of water per day are on order at the present time. His Majesty the King opened new works at Clydebank in July, which works include mechanical filters capable of dealing with 6,000,000 gallons a day. It should be noted that these filters have superseded the old slow sand filters, which have now been converted into storage reservoirs. The Irvine and District Water Board have ordered similar filters to deal with 5,500,000 gallons per day, which again will supersede the slow sand filters.

A very large number of similar instances, each of them possessing special features of great interest, could be quoted. Some typical examples are given elsewhere in these pages. The adoption of mechanical filters on this large scale is entirely due to the good results produced first at small installations, later at innumerable installations, both small and large, and finally at installations dealing with supplies of the first magnitude. Among other facts of interest it is to be noted that the War Office has adopted the mechanical filter for the treatment of water supplied to our soldiers in various camps.

[illegible] TREATMENT.

One thing is becoming more and more evident—namely, that as the raw water drawn from a river or storage reservoir varies in quality from time to time, so must its treatment also vary. Dr. Houston has drawn attention to this fact in the case of London in relation to the bad quality of the water

entering the reservoirs when floods follow a dry period. With the modern filter by a simple provision of settling tanks and mixing channels such preliminary treatment as is required can be given, and the treatment may be modified to any required extent, or if the water be sufficiently pure no chemicals need be used at all.

At most, if not all, of the new works provision is also made for the application of a sterilising agent to the water. Greater care is also being given to the manner in which coagulants and chemicals are added to the water. At St. Louis it is estimated that a saving of 30 per cent of the chemicals will be effected merely by allowing a long period for the softening action of the lime before sulphate of iron is added, thus avoiding the loss due to chemical reactions.

The form of the filters at these large works naturally differs from that of the filters used at smaller works. We find that reinforced concrete tanks, say 50 ft. by 50 ft. in plan, are built, and these contain about 30 in. of sand; but they differ from the old sand filter in the fact that there are facilities for regular and perfect mechanical cleaning, that the sand is of finer grade, and that the filters work under a greater pressure. A great deal of work has been done in devising methods for perfect and regular cleaning. As already stated provision is generally made so that the water can be sterilised after filtration if required.

[illegible]

With regard to sterilisation, the work of the past year does not appear to show any particular advance with regard to ozone sterilisation, and we have heard comparatively little of the ultra-violet rays.

With regard to the use of ultra-violet rays for water sterilisation it seems that the most important event of the year was the adoption of the method by the city of Niagara Falls, New York. As reported in the *Canadian Engineer* a contract was awarded to the R.U.V. Company of New York for the installation of thirty-five "pistol" lamps for the sterilisation of the city supply by means of the ultra-violet rays of the mercury vapour quartz lamp. This event was of particular importance as being the first municipal installation of the system in America. Moreover, this is a very large installation, the capacity of the filters in connection with which the lamps are to be used being 10,000,000 gallons per day. The lamps are to operate in banks of seven, and are to be spaced 30 in. apart. Each bank will rest on a concrete channel 2 ft. wide by 3 ft. deep by 26 ft. long, and the water will pass through the channel at a rate that will allow an exposure of thirty seconds to the ultra-violet rays. The cost of the installation is stated to be £4,120.

It is a distinct advantage in this system that the degree of treatment can be varied according to the quality of the water by having more or fewer lamps in operation at one time. Judging from the results at Marommes les Rimen in France and elsewhere it seems also that a much higher speed of preliminary filtration is possible than would be required for the treatment of the same water without subsequent sterilisation. Provided that the water is rendered free from all small, visible suspended matter, the rays will deal with the micro-organisms. Interesting as the description of the Niagara Falls installation may be, and encouraging as it must also be to the advocates of the ultra-violet rays system, we hear little concerning its adoption elsewhere. Probably a great deal will depend upon the success of this trial.

It is not to be doubted that the ozone process, which possesses many advantages, would have been largely adopted in America but for the historic failure at St. Louis, the direct result of which was that America gave its full attention to hypochlorite treatment of water with the splendid results which are now a matter of common knowledge.

HYPOCHLORITE STERILISATION AT HOME.

In this country sterilisation by means of hypochlorite has been very largely adopted, but, owing probably to popular prejudice, very little has been said about it. Neither have we worked upon the American lines, for, whereas in America each engineer and chemist designed his own system and plant—sometimes with results rather trying to the consumer—in this country the matter has rested generally in the hands of a few experts and with manufacturers of special apparatus, who have done excellent work in this respect, and have shown great enterprise and skill in perfecting sterilising plant, and also in its installation. Where the water is treated in this country we hear very little about it, and this is the best possible proof of the satisfactory nature of the system.

It cannot be doubted that the good health statistics of our armies both at home and abroad are due to the care exercised in the matter of water supply. Where large bodies of men are suddenly gathered together in camps, time does not permit of the construction of waterworks. The hardships of the soldiers would have been greatly increased, and enteric might have claimed a host of victims, were it not for the fact that the authorities are able to procure at short notice plant capable of treating the worst water and rendering it not only safe for drinking purposes but of the best possible quality. In this alone we may feel a debt of gratitude to those workers who have discovered the means for [illegible]

In America the sterilisation of water by means of chlorine gas, a method which has been much criticised by chemists, is certainly gaining ground. This process has been adopted for the final purification of the water supply of Baltimore, and it certainly claims our serious attention.

[illegible]

The general adoption of hypochlorite [illegible] water sterilisation has been discussed many times in these pages, and it is unnecessary to say much more about it. It is interesting to note that at Paris, where the ozone treatment of the water has been so much in evidence, hypochlorite treatment is used for the emergency supply which is required in the summer owing to the original provision of water being short by about 100,000 cubic metres a day at such times. When this occurs the reservoirs are depleted and an emergency reservoir is instituted for the use of the Marne water, which is filtered rapidly and sterilised by means of hypochlorite.

Statistics from America show that, taking eight cities where hypochlorite treatment has been adopted for comparison, there was a reduction of 72 per cent in the typhoid death-rate as a maximum in Cleveland and a reduction of 35 per cent as a minimum at Baltimore, the average reduction in the typhoid fever rate in the eight cities after the use of hypochlorite being 51 per cent. These figures show that a number of valuable lives have been saved; but what has been the saving in the number of cases of sickness! It is only reasonable to assume that for each life saved there were several cases of sickness prevented, and if to this were added the number of persons saved from sorrow and suffering by the death or illness of friends or relations, it will be seen that many persons living in those eight cities owe a lasting debt of gratitude to those who removed the typhoid germs from the water. Moreover, it is highly probable that other disease germs are removed by sterilisation. Typhoid and cholera germs we know, but all evidence points to the fact that there are other germs more or less harmful in polluted water which are destroyed by sterilisation. In the past year it has been shown that goitre is caused in this way, and that sterilisation will prevent it. More and more clear does it become that the b. coli are a danger-signal.

We also have had the report of Dr. H. R. Gaylord to the United States Bureau of Fisheries before us. His investigations tend to show that cancer is a water-borne disease. Certainly we have

as yet heard no more of it. However, in spite of theory, it has been observed that a pure water supply results in a decrease of many diseases which are not supposed to be water-borne.

LIME TREATMENT AND STERILISATION.

The interest taken in the question of the softening of water supplies has greatly increased, and is reflected by the large number of water-softening plants which have been laid down within a comparatively short period to treat both public and private water supplies.

The results obtained by Dr. Houston in the sterilisation of water supplies by means of lime have redirected attention to the great advantages of lime softening. From Dr. Houston's results it is gathered that the practical value of lime in the purification of water is greater than has generally been considered.

The lime process is certain and rapid in its action, easily applied, and inexpensive to carry out; while the installation of the necessary mechanical plant for adding the lime to the water for both bactericidal and softening purposes is well within the means of even the smallest water authorities, whom it enables not only to secure a high degree of purity in their water supplies, but also to increase the available sources of supply by the utilisation of flood water and so forth, which can be rendered perfectly pure and potable by the lime process.

The question of wholly or partially softening public water supplies is one which it is easier for a small public authority to deal with than a large corporation, as the cost of the treatment is in direct ratio to the quantity of water supplied. On this account the smaller water authorities have shown more activity in the installation of softening plants than the water authorities of the larger towns.

LEAD POISONING.

In a report to the Local Government Board on the occurrence of lead poisoning at Guisborough it will be remembered that Dr. Frank Symons found that, though lime treatment had been carried out to counteract acidity, this particular water produced more cases of lead poisoning after than before the treatment was applied. This was apparently due to the "erosive" ability of the water as distinguished from its solvent ability. In relation to this quality Dr. Houston had already pointed out that the lime treatment is seldom perfectly satisfactory as regards the removal of acidity, and that such treatment "seems actually to render the water more prone to erode lead." It seems that the chemical and physical conditions which favour erosion are not yet fully understood. Here, then, is a fresh field of research for the chemist, and a very strong reason against the use of lead pipes. It will be found in the most recent treatises upon the subject that the risks of using lead pipes and cisterns are much greater than is commonly supposed. It is true that they may be used safely with certain waters, but in the case of any new or doubtful supply lead pipes certainly ought not to be used until the chemist has made sufficient trials or tests of the water to enable him to take responsibility for its use with lead pipes.

EFFECT OF THE WAR.

The influence of the war upon trade may be gathered from the publications issued recently by the Commercial Intelligence Branch of the Board of Trade. It is to be gathered, for instance, that the total exports of Germany as regards pumps and pumping machinery are nearly as large as those of this country, great trade being done with France and Russia. Having regard to Russia in particular, it is evident that there should be a great opening for British trade. The German imports into our own Colonies have been remarkable, far exceeding our own imports in many cases. With regard to pipes it is estimated that the removal of German competition may lead to the doubling of British exports. In some countries we possess a great part of the trade, but in others the Germans had captured it entirely, notably in Continental countries, such as Belgium.

At the end of the war there must undoubtedly follow a period of reconstruction in which German competition will be absent. In any case it is clear that for the present German competition has ceased to exist, and that the large markets formerly supplied by German firms will be open for the manufacturers of other nations.

The commercial conditions in the iron and steel tube trade, as in all other branches of the steel trade, have been particularly difficult during the past year. The volume of the home trade has been exceptionally good throughout the year, but prices were very low in the export trade, particularly during the first six months, due to the acute trade depression in Germany, which led to abnormal and organised dumping operations from that quarter.

Our Colonies and South America in particular have all suffered from trade depression during the year, which has been accentuated since hostilities began.

As a result of the prosperity in the previous year (1913) considerable extensions to works were undertaken.

The present lack of demand from our Colonies has meantime been largely counteracted by the abnormal requirements of the War Office and Admiralty, and it is anticipated that as these abnormal demands decrease rapid Colonial developments will take their place. Undoubtedly a great many Colonial orders temporarily suspended during the last five months of the year will be placed directly decisive results in favour of the Allies become apparent, not only to the extent of keeping present plant fully employed, but providing work for the new plant on point of completion.

DIFFICULTIES WITH CONCRETE STRUCTURES.

With regard to the difficulties due to the contraction of concrete, it is interesting to note that tests to determine the thermal changes in large masses of masonry are being undertaken by the Board of Water Supply of the City of New York at the Kensico Dam, Valhalla, N.Y. The dam is being built of cyclopean masonry, faced on the up-stream side with moulded concrete blocks and on the down-stream side with granite. This dam will have vertical expansion joints. The results of the tests should be of considerable interest, as they will show the effects of temperature changes upon this mass of masonry, and should indicate the internal stresses set up. Special instruments will be used consisting of two coils of fine wire of two metals, having different temperature coefficients of electrical resistance, connected in circuit with batteries and a galvanometer. The wires are of such a size and length that a small temperature change will cause a measurable change in the electrical resistance which will be indicated by the galvanometer or which may be detected by a telephone. These instruments are embedded in the masonry as the work proceeds.

The vexed question of leakage in concrete structures due to the development of cracks has exercised the minds of many engineers, and will probably continue to do so. Where plain concrete is used it is common experience that cracks develop in structures above the ground. Such cracks are generally made good, and may or may not give further trouble, according to the particular conditions of the case. In underground structures the trouble is generally less, and even if it exists is less apparent. It cannot be said that expansion joints provide any very satisfactory solution of the difficulty. Most engineers have experienced difficulties of the kind mentioned, and it will generally be found that the only solution of the difficulty is to repair the cracks and to hope for the best. Furthermore it is generally found that, practically speaking, the cracks having been once repaired give very little trouble.

With regard to this matter it is interesting to

note first that the engineers of the Catskill Aqueduct are no more free from troubles than their English brethren, and next that they are no more able to solve the problem than we are ourselves. It is both consoling and productive of the best of feelings when we read the frank statement in the American engineering press that "experiments show that percolation of water through walls of conduits takes place almost entirely through expansion joints." That is exactly where we should expect to find it in our own work. The engineer has two alternatives—either to make his work monolithic and to have cracks develop at irregular intervals or to make expansion joints and so find that the differences in temperature produce opening and shutting.

We read in the *Engineering Record* of New York a report of the Catskill Aqueduct: "As would be expected, the most important factor causing variation in joint opening, and therefore in leakage, is the difference between the temperature of the concrete at the time it was placed and at the time of making the test. Whenever the latter temperature was higher than the former, the joints were comparatively tight. Under the reversed conditions the greater openings or leakages occurred with the greater differences of temperature. The temperature factor was so great that all other factors were obscured by it; yet those other factors were of enough influence to prevent the deduction of the law of relation of leakage to temperature leakage. The following statements may, however, be confidently made:—(1) Leakage from the cut and cover aqueduct is almost entirely through the joints . . . very little through the concrete mass or elsewhere than at the expansion joints. (2) There is a progressive diminution in the amount of leakage with the lapse of time entirely independent of temperature influence, and (3) the method of stopping leakage through the expansion joints by filling with Portland cement grout is satisfactory, effective, and permanent." It is the final conclusion that throws most light on the subject. Those grouted expansion joints will expand no more; but if they are grouted while the temperature is high they will certainly open again when the temperature falls. It seems that from this we can learn nothing new. The concrete tunnel will develop cracks; but after these have been made good they will give no more trouble, because the tunnel is kept full of water, and the temperature does not vary to any great extent. The troubles at the Catskill Aqueduct are in conformity with general experience elsewhere, and they appear to provide an argument in favour of reinforced concrete.

[illegible] WATER DAMS.

A very large number of dams of the greatest size and importance, constructed in various ways under differing conditions, exist in the world at the present time. Some of these have failed entirely, and others have given great trouble owing to leakage, while the rest have fulfilled their purpose and exist as examples of engineering skill. Naturally a very great deal of attention has been given to the subject, the chief result of which has been to show the absolute importance of geological considerations. The necessity for the most careful geological survey being made over the whole site of any proposed reservoir has been established. Money expended in such work is to be regarded in the light of an insurance, and any saving of expense in this respect is the greatest folly. An increasing number of examples of large storage reservoirs which leak owing to unexpected faults and fissures amply demonstrate the importance of the most careful geological investigations being made as a preliminary step.

We find that new masonry dams are now being constructed on granite or other rock which has first been treated by making borings and grouting all possible fissures with cement under pressure. One may also study with advantage a number of instances where engineers have courageously faced appalling difficulties in cases where dams or reservoirs have shown serious leakages. There are a good many cases which might be referred to, some of which are being dealt with at the present time. A good instance is the case of Loch Arklet. The dam which holds up the water of the loch to its new level is constructed of concrete faced with masonry. Its length is 1,050 ft., and its greatest height is about 35 ft. Its foundations are solid rock, but about half-way across the dam a bad fault crossed the foundations diagonally, terminating on the downstream side in a large pocket of soft material. This bad material had all to be cut out, so that for a length of about 50 ft. the foundation to the bottom is 100 ft. below the top of the dam.

These difficulties have now been entirely overcome. Again, the new Kelso reservoir, recently completed, was found to leak at one of the sides near the dam. The dam is built in solid rock, and it is believed that the water is escaping at some fissure in the side. Many more instances could be quoted showing the difficulties with which the engineer has to deal.

The sealing or filling of fissures in rock by means of grouting with cement is being adopted as one of the recognised methods of engineering construction. In making the deep shafts and tunnels of the Catskill Aqueduct cement was injected at very high pressure with good results, a pressure of 1,000 lb. per square inch being used at times. Where a shaft has to be sunk in fissured rock full of water it has been found possible to sink borings 90 ft. or more in depth and to inject cement at such pressure and in such quantities as to fill and seal the fissures in the rock round the shaft, after which the shaft can be excavated without further difficulty from the water. Similarly, tunnels can be driven after the water-bearing fissures have been sealed.

[illegible]

Several books and many papers and treatises of great merit have been published during the past year. To review the whole of the year's literature would indeed be a great task. From this it is apparent that our best workers are keeping a careful record of their doings and are following the excellent plan of making all new results known to the world as quickly as possible. We may refer to such typical examples as the reports of Dr. Houston to the Metropolitan Water Board, to the Board's Annual Report, to the Memoirs of the Geological Survey, and the reports of the Local Government Board. It is to be noted that the presidential addresses of the Institution of Civil Engineers and of the Society of Engineers each dealt with the subject of water supply.

Mr. Allen Hazen's book, entitled "Clean Water and How to Get It," discusses every kind of water supply, and is certainly one of the most valuable works of the year. "Water Supplies: their Purification, Filtration, and Sterilisation," by Drs. S. and E. Rideal, is also a book which should receive careful consideration, containing as it does the latest information upon water treatment. Another very excellent book is that of Mr. George Chandler Whipple on the "Microscopy of Drinking Water."

It is quite impossible in the present article even to refer to the very large number of books, papers, and treatises which have appeared during the past year. The papers read before the Institution of Water Engineers, though fewer in number than usual, are of considerable importance and merit; also those read before the Society of Engineers; while the paper read by Mr. Lewis Mitchell on "The Provision of a Municipal Water Service" has been reviewed so recently in these pages that further reference to it is unnecessary.

Institution of Electrical Engineers.—It is officially announced that there will be no annual dinner of the institution during the present session.

Johannesburg Town Hall and Municipal Offices.

EXTENSIVE USE OF REINFORCED CONCRETE.

JOHANNESBURG TOWN HALL AND MUNICIPAL OFFICES.

Among the most important features in the construction of the Johannesburg town hall and municipal offices is the extensive use which has been made of reinforced concrete, there being no less than 130,000 sq. ft. of flooring constructed in this material, and a total use of approximately 200 tons of reinforcing steel. The architects, Messrs. Hawke & Mackinlay, of Johannesburg, adopted reinforced concrete for practically the whole of the constructional work. It was their original intention to employ rolled steel joists and stanchions, but after careful consideration and comparison, it was found that a considerable saving could be effected by the use of reinforced concrete.

The reinforced concrete work was designed in the Kahn system by the Trussed Concrete Steel Company, Limited, Carlton House, Westminster. The floors were calculated for a superimposed load of 1 cwt. per square foot, and the calculations were based on the recommendations for reinforced concrete design as issued by the Royal Institute of British Architects, together with the regulations of the local by-laws.

The position of the building is a central one, and the front façade, measuring 200 ft., is directly opposite the General Post Office, the sides extending 400 ft., face Market and President streets respectively, while the back adjoins an extensive garden scheme which is at present being carried out. The total height of the building from the basement to the top of the dome is approximately 130 ft. In the centre of the building is a large open courtyard measuring 83 ft. by 63 ft., which provides light and air to the inner offices. The basement, which extends over approximately half the area of the building, is chiefly occupied by air and heating chambers (in connection with the Plenum system of ventilation), by offices for the tramways department, and by a large strong room measuring 84 ft. by 32 ft.

Fig. 1 is a ground floor plan showing the arrangement of the reinforced concrete beams. It will be noted that the construction is fairly simple and straightforward, although the numerous different levels of the floor necessitated exceptional care in the preparation of the detail working drawings. The arrangement of beams was fixed generally by architectural considerations, and was not always economical from the purely constructional standpoint. All the reinforced concrete beams are indicated by numbers which are arranged on a schedule giving in detail the size of the beam, and the reinforcement required for each. In many cases special details of reinforcement in the beams were given in drawings of which Fig. 2 is a typical instance. It will be noticed from the plan that in a few cases the slabs are of considerable span. The largest of them is approximately 21 ft. span, being 9 in. thick, with reinforcement consisting of ¾-in. Kahn trussed bars, placed at 15-in. centres, running in both directions. The ground floor consists principally of the main concert hall, the Selborne hall, the rates hall, and the municipal offices. The main concert or town hall is 150 ft. long by 90 ft. wide, with a height of 60 ft. from floor to ceiling, and has a seating accommodation for 3,000 people. The floor of this hall is of American maple set on springs, while the organ and orchestra floors, with the cantilever balconettes and corridors, are all of reinforced concrete. The proscenium opening, 45 ft. wide, is spanned by a reinforced concrete beam 66 in. deep by 27 in. wide, reinforced with three 1¾-in. Kahn trussed bars and two 1-in. and six ¾-in. Kahn rib bars, all the latter being bent up towards the ends.

The rates hall, 84 ft. by 62 ft., is situated near the main entrance. Over this hall there is a very heavy reinforced concrete beam (marked 29 on Fig. 1), the size of which is 30 in. deep by 18 in. wide, reinforced in the bottom with three 1¾-in. Kahn trussed bars and two 1¼-in. and four 1¾-in. Kahn rib bars, making a total cross sectional area of 12·87 sq. in. of reinforcing steel, together with four 1¾-in. Kahn trussed bars in the top of the beam. The details of the reinforcement are shown on Fig. 2. The total load on this beam was 52 tons, of which 26 tons were uniformly distributed, the other load consisting of two 13-ton point loads concentrated at the two-third points of the beam. As a typical example, it is interesting to note that if this beam had been constructed in steelwork it would have required a 22-in. by 12-in. rectangular girder weighing 173 lb. per lineal ft., and the overall size of this girder cased in concrete would have been 26 in. by 16 in., which is slightly less than the size of the reinforced concrete beam. The fol-

lowing, however, is a comparison of the approximate cost of the two methods of construction. For fire-protective purposes it would have been necessary to encase the girder in concrete, which, as previously stated, would have been slightly less in overall size than the size of the reinforced concrete beam, and the difference in concrete is credited to the steel-work.

	Per foot-run.
In steelwork—	
173 lb. at 20s. per 100 lb. ...	£1 15 0
In reinforced concrete—	
75 lb. at 30s. per 100 lb. £1 2 6	
Saving of concrete and centering in favour of steel girder, say 1s 6d. per foot-run .. 1 6	1 4 0
	0 11 0

This comparison—it is pointed out in *Kahnoid Engineering*, to which we are indebted for these details—shows a saving of 11s. per foot-run, or approximately 33 per cent of the total cost of the steel compound girder, in favour of the reinforced concrete beam.

The columns in the rates hall are 4ft 2in. square reinforced with Kahn rib bars laced together with ⅛-in. diameter wire ties, the number of verticals and the spacing of the ties varying according to the load to be carried. These columns run down to a solid rock foundation.

The council chamber measures 67 ft. by 30 ft., including the reinforced concrete gallery. It has a lofty panelled and richly moulded dome-shaped ceiling, the height from the floor to the top of the dome being 30 ft.

The Selborne hall, like the main hall, has an American maple floor set on springs. Along either side are doors leading to balconies, one looking on to President-street and the other overlooking the inner court. At one end is the stage, under which are the artists' dressing-rooms, while at the opposite end

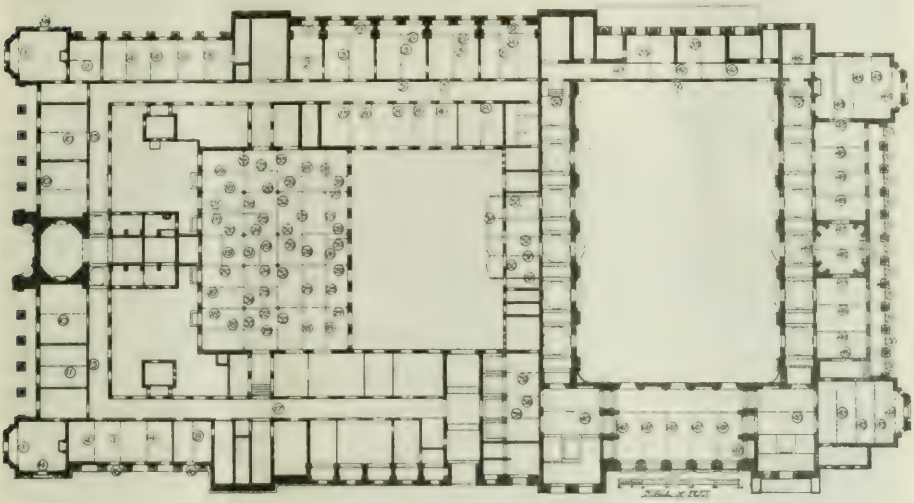


FIG. 1.—GROUND FLOOR PLAN, JOHANNESBURG TOWN HALL.

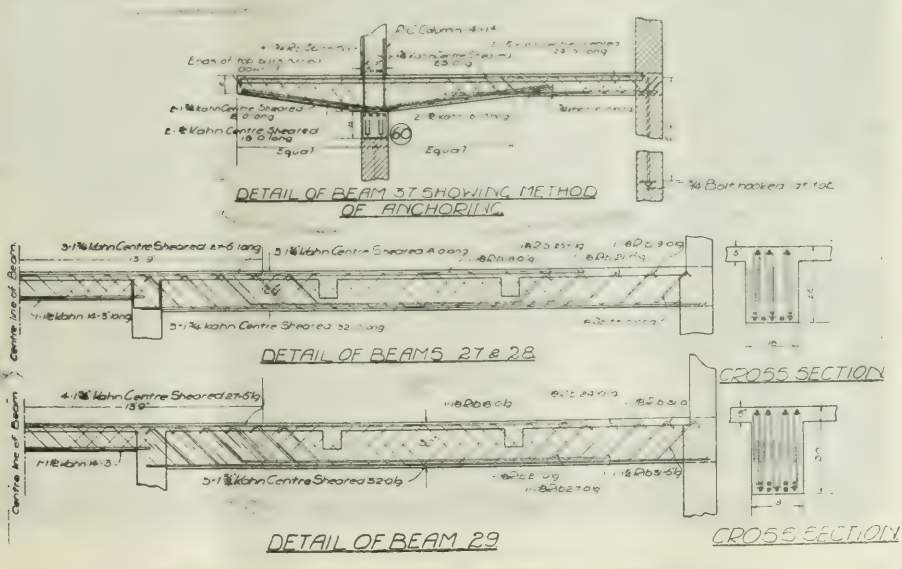
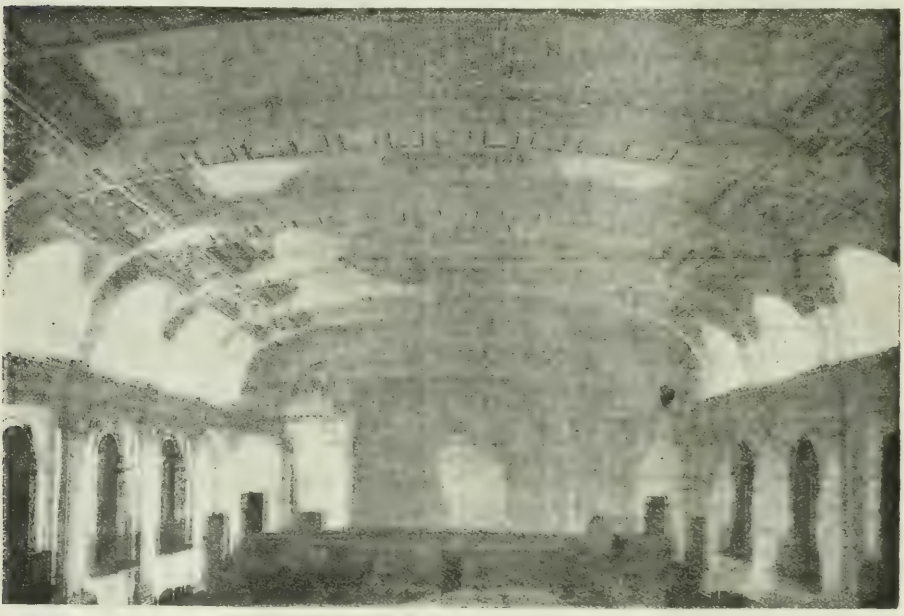


FIG. 2.—TYPICAL DETAILS OF BEAMS, JOHANNESBURG TOWN HALL.

is a cantilever gallery constructed entirely in reinforced concrete.

Around the main hall on this floor there are spacious lounge corridors, crush halls, and foyers, all the floors of which are in reinforced concrete, finished in mosaic. Leading from the corridor at one side is a conservatory and refreshment room, the conservatory being cantilevered out over the inner court and carried on beams marked A on the plan (Fig. 1). The loads on these beams were not sufficient to balance the upper tendency due to the cantilevering action, and it was therefore necessary to provide additional tailing-down weight by means of anchoring the beams to the brickwork underneath with long bolts.

PLACING KAHN SYSTEM REINFORCEMENT IN FLOORS, JOHANNESBURG TOWN HALL



MAIN GALLERY HALL, JOHANNESBURG TOWN HALL

The tower, which forms the central feature of the front façade, as will be seen from the general view of the building, is carried up directly over the front

entrance. The dome surmounting it is 20 ft. span, and is constructed of a 6-in. thickness of concrete, with a mesh of 2-in. Kahn rib bars, the dome being

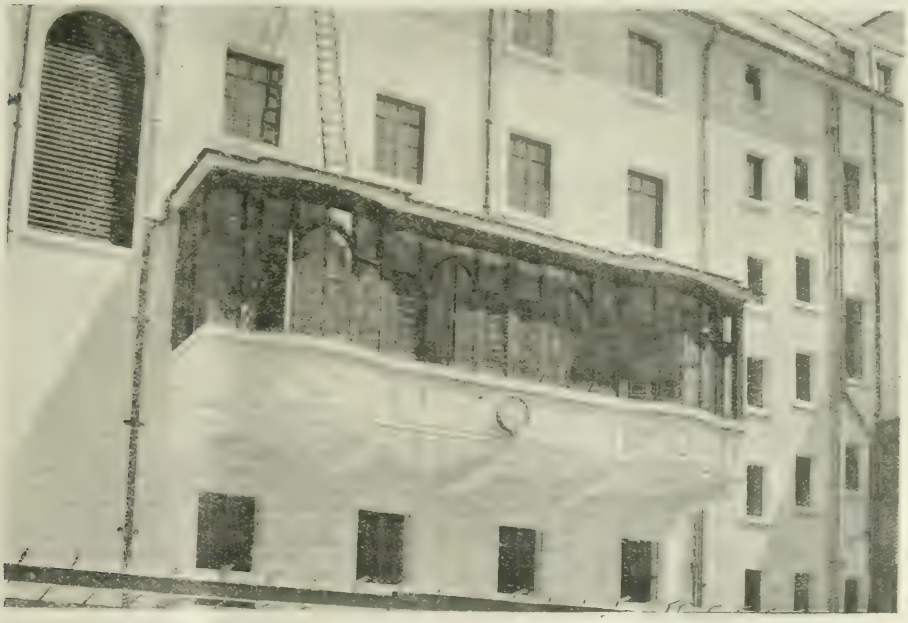
of the grounds and gardens, which, we [illegible] nearly an additional £6,000.

The building was erected by Mr. M. I. A. M[illegible]

Selborne Hall, Johannesburg Town Hall.

finished on the outside with green [illegible]. The [illegible] pitched roofs are also covered with green tiles, and

were signed the contract in January 1912 and completed the work before the end of 1914.



Cantilevered Conservatory in Inner Court, Johannesburg Town Hall.

the contrast between these and the grey stone with which the building is faced is very pleasing.

The total cost of the work was approximately £300,000, which figure does not include the laying out

"Pudlo."—His Majesty's Office of Works are users of "Pudlo," and in the Dundee new post-office the cement mortar and all renderings are to be waterproofed with the material.

Groynes and Sea Walls.

By A. T. WALMISLEY, M.INST.C.E.

Sea defence works combine the construction of sea walls and groynes, the latter being used for the purpose of gathering the shingle and thereby raising the beach of a foreshore. They stay the littoral drifting action. Groynes themselves cannot be regarded as a protection to a shore, but are serviceable in the effect they produce on the beach, mainly across the intersection of the lines of high and low water levels upon a foreshore. They do not create fresh material, but rely on wasting cliffs, &c., to contribute fresh supplies which they collect. The term "foreshore" is frequently limited to land lying between the levels of high and low water of ordinary spring tides, but legal rights may include the bed of a navigable river under special circumstances.

The whole subject of foreshore protection is most intricate. Groynes should not be put in without a proper consideration of the local conditions. The removal of shingle from a coast by which the latter is robbed of its natural protection should not be allowed. The object should be to arrest the shingle upon the windward side of a groyne without producing too much scour upon the lee side. The natural barriers which exist against the denuding action of the sea should be maintained.

Waves do not consist of a forward movement of a mass of water, but their action in the open sea may be compared to a water wheel being due to a disturbance propagated through the water. So long as the imaginary wheel in its oscillations does not touch the bottom, no forward motion is given to the wheel, and a wave of oscillation is formed. As the motion is, under such circumstances, simply up and down, unless the crest is propelled by wind, the water resists being unlevel, and seeks to return to a level. If the supposed wheel is in action in water of a depth, where it touches the bottom, or where it strikes a resistance, then a wave of translation is formed, and the water travels in a direction dependent upon the influence of such obstruction to its oscillation, the forward translating motion increasing as the water becomes shallower.

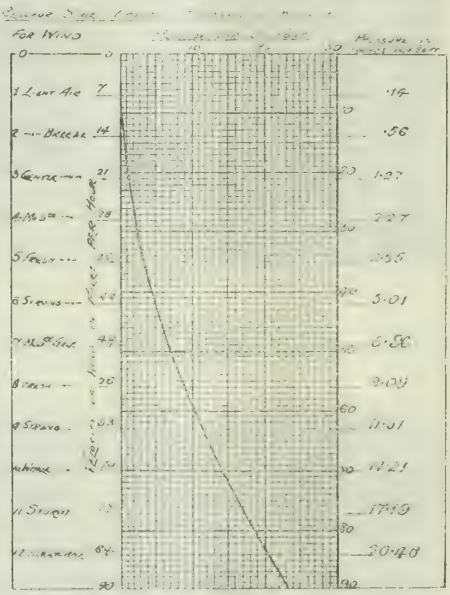
The waves that break upon a shore are due to wind, but intervening shoals will also break up a wave. Alongside winds are the chief motive power in transporting shingle, and sand, as low down as the wave action extends. Below the wave action the tidal or other currents exercise a transporting influence. When a flood tide and a heavy sea run in the same direction there are heavy waves, but when the tide runs in opposition to the wind waves, there is a choppy sea, the tide tending to run down the waves. It is the wave action created by the prevailing wind of the locality, and not by the wave action of the flood tide, that reduces movement of beach on a shore.

The force of waves which beat under the action of a gale against a cliff or sea wall increases nearly as the cube of the depth of the water upon the foreshore in front of them. As the beach becomes lowered, the depth of water increases, and consequently the volume and velocity of the wave. Therefore at high water the most damage is accomplished, although at low water the effects seem to be the greatest.

The effect of gales is greatest when the wind, after blowing along the coast in the same direction as the main stream of the flood tide, changes about the time of high water to an on-shore direction. The force of the wind depends mainly upon the locality. A pressure of 1 lb. per square foot of exposed surface is produced by a velocity averaging 18½ miles per hour. A pressure of 40 lb. per square foot would be produced by a mean velocity of 117 miles per hour, and a pressure of 56 lb. per square foot would be produced by a mean velocity of 139 miles per hour. These comparisons are based upon the formula $P = \cdot 0029V^2$, where P = unit pressure in pounds per square foot, and V = mean velocity of the wind in miles. Some authorities assume a higher value, and take $P = \cdot 005V^2$. It is generally found that wind pressure is much greater near the sea than inland, and also at high elevations than in low countries.

Mid-ocean tides rise and fall comparatively to a small amount, but as soon as a tidal wave has traversed the ocean and become influenced by coast conditions, an hydraulic head becomes formed in its passage, and tidal ranges are the result.

A wave is "a form," and not "a thing." The form advances, but not the substance of the waves, and results in waves of oscillation. When a corkscrew is turned round, the thread appears to move forward, and the apparent onward motion of waves at sea is a similar delusion. Waves have a vertical motion. The wind pressing unequally on the surface of the sea depresses one part more than another. Every depression causes a corresponding elevation, and these undulations are called waves. A record storm that makes a "washout" of the beach sucks it out below the level of the lowest spring tide into the run of the off-shore current that carries it off. Here, however, the on-shore current comes in and tends to drive the material back landwards. The result de-



WIND PRESSURE.

P = wind pressure in pounds per square foot.
V = mean velocity in miles per hour.
$P = \cdot 0029V^2$.

A pressure of 0·7 pound per square foot is produced by a velocity averaging 15½ miles per hour.

A pressure of 25 pound per square foot is produced by a mean velocity of 93·0 miles per hour.

A pressure of 47 pounds per square foot is produced by a mean velocity of 125 miles per hour.

pends on the wind waves—whether favourable to help reclamation or to denude the foreshore. At every high water the on-shore current will endeavour to rescue from the off-shore current, but, in spite of its efforts, a considerable portion of the sucked-out beach remains appropriated by the off-shore current.

The wind waves are merely the distant echoes of the greater waves elsewhere. They originate in the pressure of the wind upon the surface of the open sea, and the attempt of the water to regain its level. Irregularity of pressure creates oscillatory movements which radiate from the place of origin until they die out or reach the shore.

The reception of waves being due to the wind, their development depends upon the amount of surface acted upon. The greater the length of open sea (other things being equal) the higher will be the wave which breaks upon the shore, provided, of course, that there is sufficient depth of water to admit of its formation. The length of sea surface within which the wave attains its development is termed "the fetch," which is the distance in any

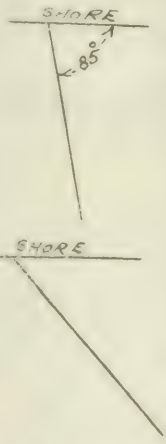
direction which is freely traversed by waves driven by the wind. The long low undulations of roll to create a ground-swell on approach to shallow water, and the breaking process is detrimental to a beach from undermining and scour.

All friable cliffs are undergoing more or less the influence of sea action, a stormy sea being active in erosion. A road constructed at the foot of a cliff above high-water level will act as an apron to save a cliff from falling; but where soft beds occur, and land springs exist at the level of marine erosion, a layer of clay would become greasy, while a layer of chalk would be dissolved.

At Sandgate, upon the South Coast, the cliffs are protected by a public road which is bounded by a sea wall. This wall, being shallow, depended upon the beach in front of it for its stability, and the beach was dependent upon the maintenance of groynes. In the absence of an efficient groyning there should have been a deeper and stronger revetment at the sea side of the main road. In the year 1894, during the visitation of a low tide, the beach proved deficient to protect the wall, and currents issuing at the junction of a fine, silty clay, which underlies the Hythe beds above the road, known as Atherfield clay, which freely absorbs water, a lubricated surface became intensified with a lateral movement of the cliff as the result of unequal vertical pressures. All such cliffs need to be well drained, and protected at the toe of their slope; also the upper surface of such roads should be sufficiently solid to prevent destruction by water falling upon it.

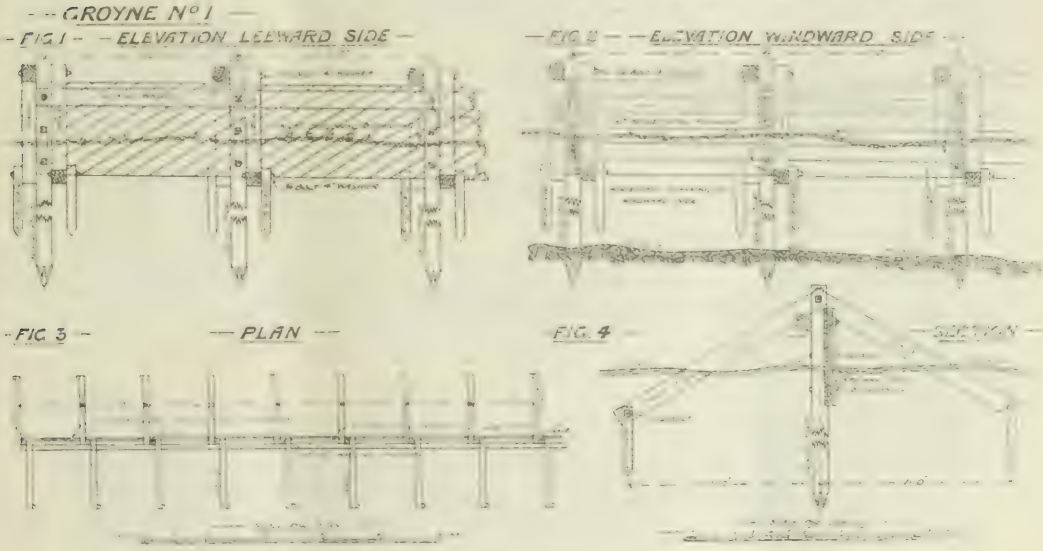
At Dover the whole foreshore is beach, upon which the houses, and parade in front of the houses, are built. The storm angle of the beach was 1 in 10, and prior to the extension of the Admiralty Pier and the formation of the eastern pier of the Government Harbour, the beach was practically inclined in front of the Marine Parade at this inclination up to the Harbour Board's boundary groyne upon the west side of East Cliff, Dover. Hence, when the parade was widened, it was not considered necessary to do more than to retain the beach under the tarred paved walk by a concrete vertical diaphragm. A retaining wall has now had to be substituted, a post-and-rail fence placed at its outer edge, and the groynes to retain the beach on the west side thereof extended further out to sea.

The secret of successful work is to connect groynes at the top end with a sea wall, to carry them well out into low water, to construct them only sufficiently high to retain the beach and not to obstruct the rush of water over the beach, and to provide them with an inclination of top edge parallel to the storm angle of the beach, which, upon the South Coast, is known to be 1 in 10. They should be placed, approximately, at an angle of 95 deg. to the flood tide, or at 85 deg. from a shore, running parallel thereto, and at a distance apart equal to the distance of their crests from the upper sea wall at their top end. Though the flood tide has very little to do with the actual [illegible] affected by the [illegible] exposed above the level of the beach to its direction. Groynes placed at angles more acute with the shore may secure the beach from scour on the lee side of them, but they assist the run of the sea in removal of the shingle on their weather side as they do not afford "pocketing" for the beach, which is pushed against them by the translating action above demonstrated. On shore, tidal currents help to build up the coast defences, the power of their velocity transporting material within tidal [illegible].



The sea wall and groyning at Hove, Sussex [illegible] as a successful undertaking. As a contrast, part of the [illegible] between Hove and Littlehampton was protected with groynes on a slanting direction to the prevailing winds.

The [illegible] of the flood tide [illegible] South



work of destruction being the action of the backwash, the beach is denuded during on-shore gales, and grows during those winds blowing off-shore due to the lack of power to drive it down the foreshore again. The direction of the prevailing on-shore winds generally coincides with the direction of flood tide. The foreshore above high-water level is not denuded by tidal action, but by the combination of wind and wave.

The interference of rocks or rising banks in the sea with the regular form of the waves, by which the [illegible] of the wave is broken, causes a breaker. The phase of the curve is the outline or arc of the wave. The wind driving the surface of the water from the top of the wave and scattering the small particles in all directions, produces the spray of waves. When a beach consists of loose shingle, a certain amount of water necessarily soaks into the area above low water, while stones are either carried along or thrown forward by the waves, and become deposited when the water recedes to attain its level, the effect of such action being in proportion as the power of the reflux

action becomes diminished, and it is thought by some that this fact may account for the comparative steepness of foreshores above tidal influence.

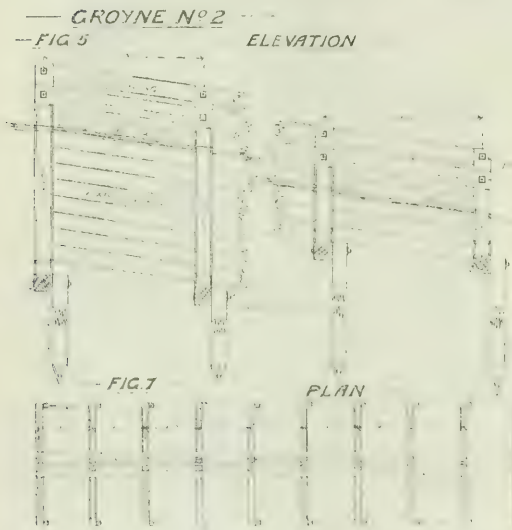
A portion, instead of going forward, buckles under itself, similar to turning a somersault, and disperses in a wave of translation. As the base of the wave gradually approaches shoal water it becomes more and more retarded, while the crest, at a greater distance from the bottom, maintains a greater velocity, overtakes the lower portion of the wave, and at last breaks or falls over the top of it, as soon as it has exploded itself. We might compare the wave carrying shingle to a gun charged with shot and without shingle to a gun firing blank ammunition.

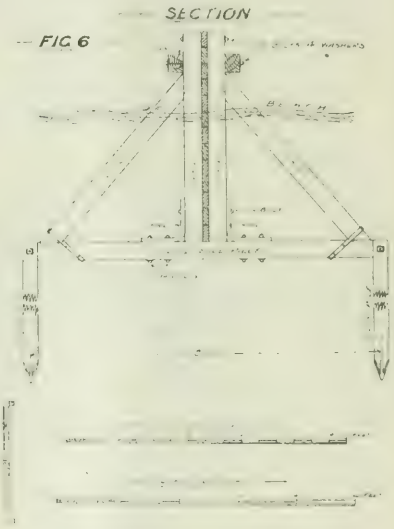
The work of the sea is, generally speaking, the work of transportation. The law of the eastward drift is well known along the South Coast, while on the East Coast the littoral drift is from north to south, the direction of the waves being principally determined by the prevailing wind. The heaviest seas are from the south-west upon the South Coast, and from the north-east upon the East Coast. The direction of those seas correspond with that of the flood tide. The waves that break upon a shore are due to the prevailing rather than to an occasional dominant wind when influencing the direction of littoral drift. The travelling action may be thus roughly described: If a pebble A is so struck by a wave as to move upon the shore in a direction Aa, the wave breaks partly into a spray, and is dispersed in all directions, and is partly absorbed, and descends in a shallow form; but some pebbles become cast beyond its reach by the crest of the wave pushing forward as does the other is just like the man throwing a stone [illegible] cast beyond the reach of the tide. The largest stones go farthest, the smallest stop first: so that the portion of the beach nearest the shore is usually composed of the largest stones, but, as regards those pebbles left within the influence of reflux wave action, these begin to have a forward translating motion, which translating motion increases as the water becomes shallower, but is reduced by the friction of the foreshore. In this action, the particle "a" is washed down to B. The forward wave action, under tidal influence aided by prevailing wind, then moves the particle B to "b," and by similar processes it is transferred from A to "c," and so on, until resisted by a groyne. At low water, or in places on a foreshore where the influences of transportation are less active, sand will be observed to be deposited.

The order of a beach in connection with a cliff as a boundary on shore, if there are no rocks, appears, in general, to be as follows:—

Above the level of ordinary high water spring tides is an accumulation of shingle; between high water spring tide and high water neap tides are shingle and gravel. This may extend to low water neap tide level, but usually there is a coarse sand having at its extreme margin a thin fringe of shingle; below the latter to low water spring tide is hard, fine sand, while seaward, for unknown distances, are shingle, gravel and sand in the stream of the off-shore current.

Groynes do not create beach, but they arrest it. Their construction is described by Figs. 1 to 16. They tend to pocket the beach pushed against them by translating action. If a groyne is constructed sufficiently high, it creates scour upon the lee side. At low water, where the influence of transportation becomes less active, sand is usually observed to be deposited.



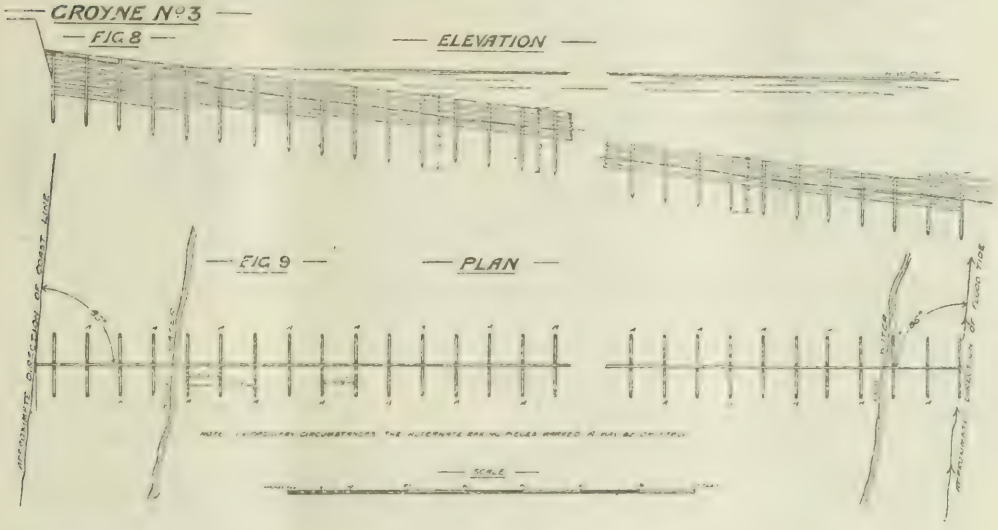


Groyne No. 1 is formed, as shown in Figs. 1 to 4, by 12-in. square piles, placed 11-ft. centres, fitted with wrought iron shoes and driven to the rock. The intermediate pairs of bays are screened upon the windward side with 11-in. by 3-in. planking, attached to the main verticals and secured as shown in Fig. 2, by short vertical pieces of raking metal attached thereto with 1¼-in. diameter bolts. Upon the seaward side (Fig. 1), 12-in. long by 10-in. walling pieces connect the tops of the main piles together, and 8-in. by 2-in. diagonal boarding is fixed between these piles. As indicated in Fig. 4, there are land struts in the shape of 12-in. by 10-in. raking pieces provided upon each side of the main piles, which are secured at their feet by 6-in. by 6-in. verticals, 4 ft. long, driven below the beach, as shown in Fig. 4, and as [illegible] in Fig. 3. The use of [illegible] deals is preferable to 11-in. deals for diagonal boarding, because the wider the planking the more irregular is the grain of the wood.

Groyne No. 2 is constructed, as shown in Figs. 5 to 7, consisting of double 10-in. by 10-in. vertical timbers, as shown in Fig. 5, fitted with [illegible] each placed 20-ft. centres as shown in Fig. 6 [illegible] and 6-ft. 6-in. centres

longitudinally, as shown in plan in Fig. 7, driven below the upper surface of the foreshore, supporting sole pieces 12-in. by 12-in., upon which short vertical 12-in. by 12-in. piles stand, which are stamped at their feet, as shewn, by bent pieces of old rail, and are connected at the top by 12-in. by 10-in. waling pieces. The railway metal is connected to the vertical by 1¼-in. diameter through bolts and coach screw to the sole piece.

be dispensed with when building the groynes by the introduction of an improved pile point (Fig. 12). As shown, the point or shoe is made with a V-shaped head, from which rises a shank contrived to receive the vertical railway metals, which are connected therewith by bolts. The angle of the point can be made to be suitable for beach, sand, or clay, as required. For chalk and strata a sharper point, as shown

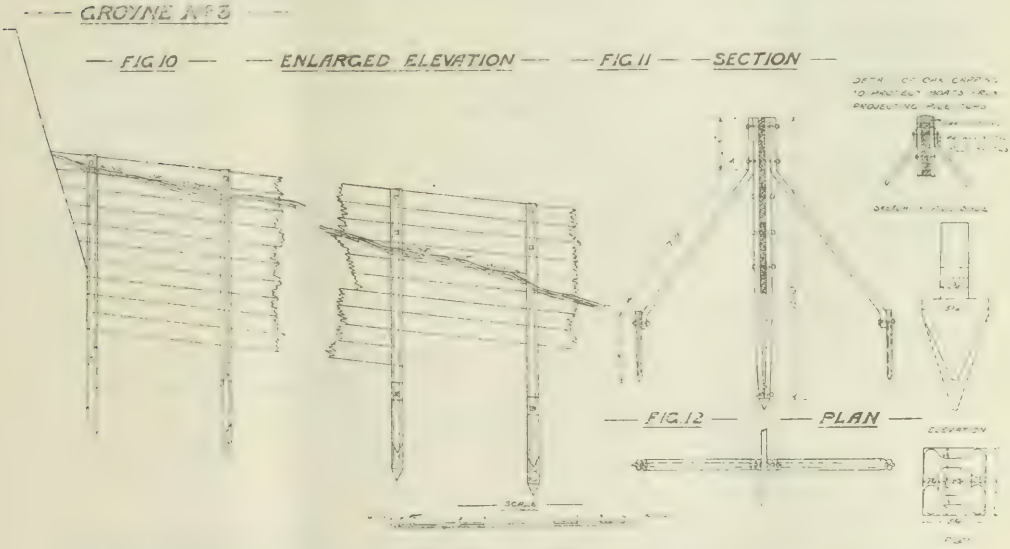


The screen is formed by 11-in. by 4-in. planking (Fig. 5), and the whole framework stiffened by 10-in. by 10-in. inclined ties, or raking pieces secured to the verticals and to the sole pieces, as indicated in Fig. 6.

In groyne No. 3 the verticals consist of old railway metals, generally in 22-ft. lengths, set out as shown in Figs. 8, 9 and 10, and stiffened by old rail raking pieces, connected (as indicated in Fig. 11)

dotted in Fig. 12, is applicable. The pile shoe is cast to suit the special section of rail adopted.

A system of open groynes which has been advocated by Mr. A. Dowson may be mentioned, consisting of uprights driven into the foreshore, having horizontal gratings attached to them, which, it is alleged, do trap and retain the shingle. This system has been employed in the estuary of the river Ribble, but the author prefers the addition of diagonal



by being placed either double at each vertical or alternately upon each side of the screen, as noted in Fig. 9. The planking between the verticals is demonstrated by Fig. 11, which also shows an oak capping. In the case of timber bolted between old rails, the practice has been adopted of welding the two metals together to form a driving point. This piece of smith's work, involving heavy labour, can

boarding as well as the longitudinal boarding, as shown in Fig. 1 for groyne No. 1, which tends to prevent apertures in a groyne, where beach could work through, and also serves in very exposed situations to tie the groynes well in, both at the head and foot.

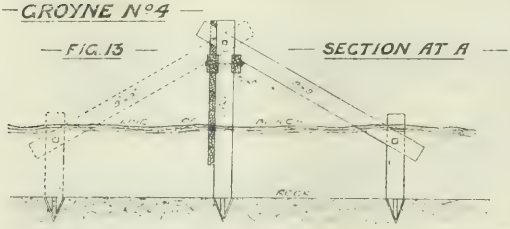
Upon flat foreshores covered with sand the sand may be arrested by laying down brushwood over the area

above low-water level, commencing at the windward side, and sowing the seed of suitable plants or grasses which will throw out roots in all directions, and will be protected by the brushwood in their growth until they acquire the necessary strength to take care of themselves. Brushwood retains its leaves when dead, and the wind, by bending the stems of the

them, and, as indicated by the enlarged scale section and plan, these uprights are set in concrete bases 3 ft. square, let into the shore, and about 4 ft. deep at 7-ft. 6-in. centres. The horizontal planks are placed two below the shore level and about three planks high above this level, the top planks being secured by spikes.

GROYNE N°4

FIG. 13 — SECTION AT A



SECTION AT B — FIG. 14

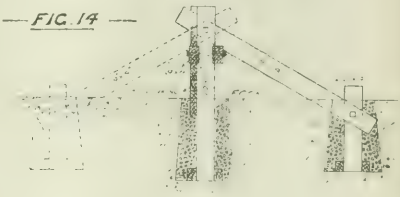


FIG. 15 — PLAN

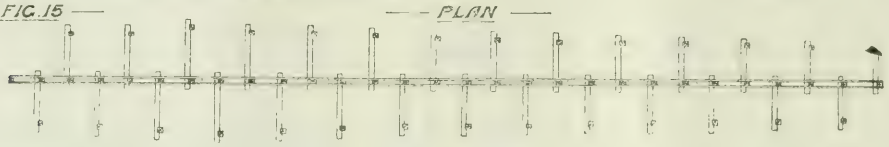


FIG. 16 — ELEVATION

sheeted planks, let down close to the sand and thus prevented the sand being blown by prevailing winds.

In Groyne No. 4 Figs. 13 to 16 is shown an example in which concrete bases are provided for the feet of the vertical piles, and also for the anchorage of the raking stiffeners (Fig. 14). Fig. 15 gives a plan and Fig. 16 gives an elevation of a groyne as put down upon this system at St. Margaret's Bay.

The wear on the lee side is minimised by the fact that they are low groynes, and require no struts or stays owing to the small surface exposed to the sea. They answer very well at Romney, for the sea front of the marsh, in the most southern part of Kent, where the tract of sand has a flat inclination; but in steep foreshores their life may be only a few hours, no piles being actually driven in this system, as they are not constructed to withstand the heavy pounding of beach

GROYNE N°5

FIG. 17 — ELEVATION

FIG. 18 — SECTION

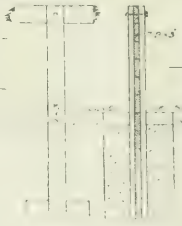


FIG. 19 — PLAN

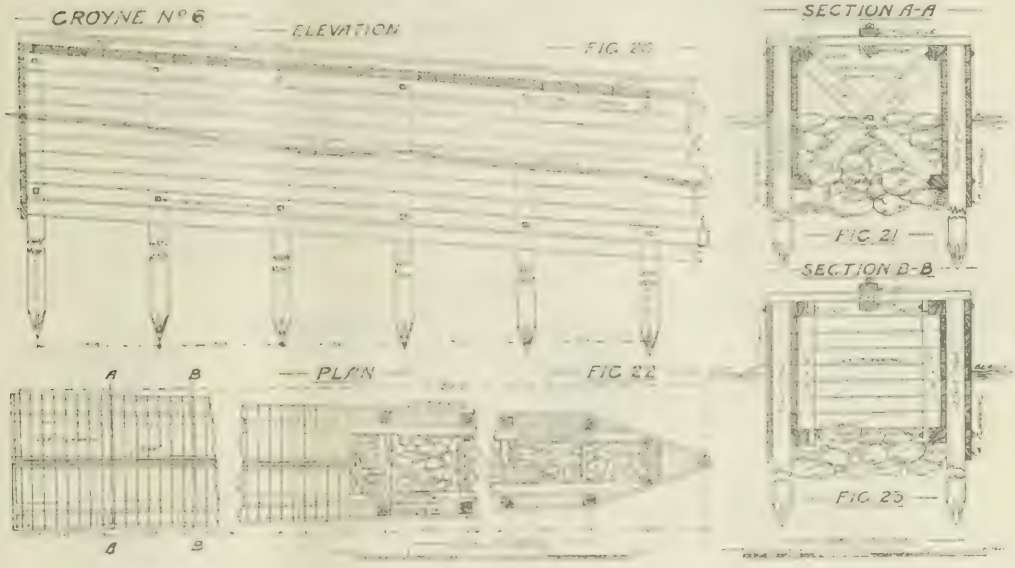
The velocity of a current, estimated as that acquired by water falling a distance equal to the height of the breaking wave v, is expressed by the formula $v = \sqrt{2gh}$, and for 1 ft. high V = 8 ft. per second, or $\sqrt{2 \times 32} = 8$.

Groyne No. 5 illustrates a groyne shown by Figs. 17, 18 and 19 upon the Case system, and consists of double upright timbers, 9 in. by 3 in., and 8 ft. long (see Fig. 17), with adjustable planking inserted between

and stones. Their object is to build up a foreshore to its natural inclination of repose, and to be gradually raised as an even accumulation becomes spread over the entire shore area, so as to obtain from the sea itself the necessary protection against its own ravages. They need careful alteration for maintenance, so that the first expense is not final. An endeavour to reach the travel of material seawards of low-water level has been made by chains carried out

to sea, and anchored to concrete blocks sunk at the foot of a groyne.

The movement of [illegible] is but very little affected by tidal currents. The sweep of the tide does not carry away projecting parts of a coast, but the tidal current becomes diverted inwards from off the shore, and the current, tending to increase in velocity where the obstruction is placed, we find beach and sand accumulate where the interception occurs, and scour [illegible] opposite to it. [illegible] as in Fig. 22 [illegible] as described in the section Figs. 21 and 23, the cross ties meeting the waling pieces in a bird's-mouth connection. This form of construction is suitable for situations where a broad-base foundation is needed, on account of the nature of the foreshore. For the deck, close planking is spiked to the walings and piles. The depth of sheeting depends upon the level of the beach, the planking being taken down [illegible]

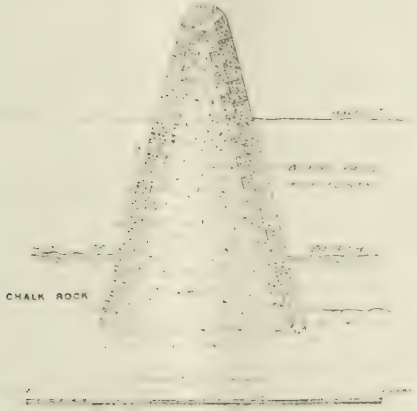


[illegible] away by reflux action where no [illegible] especially when aided by waves in rough weather. The tide has a velocity which, in the case of rivers, causes them [illegible] of their own creation; but above the tidal level it [illegible] and waves that influence a beach.

[illegible]

GROYNE N° 7

FIG. 24



the tides by raising or depressing the sea level along coasts. A strong on-shore wind increases the normal rise of the tide and prevents it from falling to its full extent. An off-shore wind produces the opposite result.

Groyne No. 6.—A box groyne is exhibited in Fig. 20

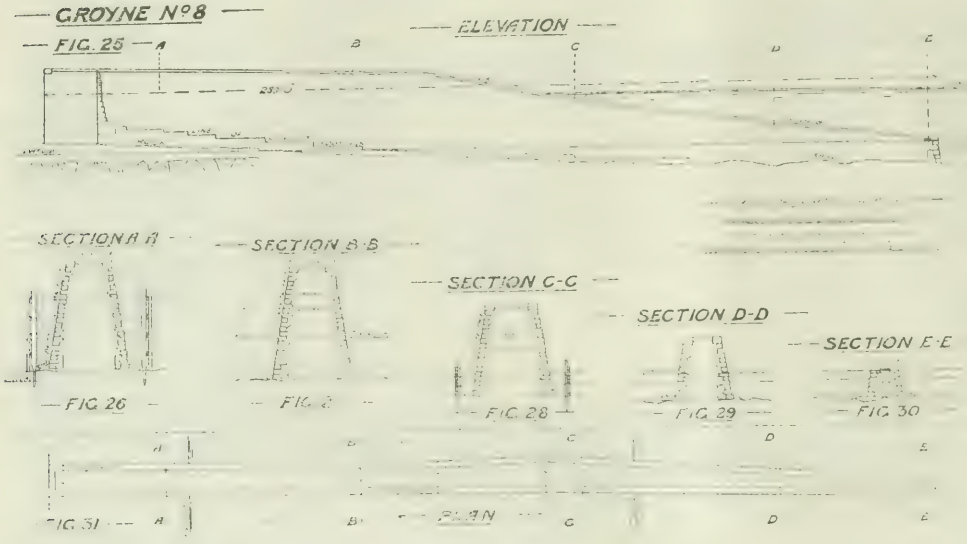
to the sub-stratum of the blue mud below the beach. The scour, as may be seen at any bridge pier in the dry season, begins at the nose of the pier and extends along the sides in a curve like a horn, and sand is usually deposited in a line with the tail of the pier. The scour is due to a vertical whirling motion of the water set up at the nose of the pier. This can be prevented by running out a false cutwater of pitching which will divide the water gently, and enable it to pass the pier with a steady and even flow. The shape of the surface of the pitching is very similar to that of a boat turned upside down, the part coming through about where the mast would be stepped. The best shape for a groyne is one to [illegible] which will best divide the water and allow it to reunite without shock and with minimum disturbance, and the contour of the [illegible]

Groyne No. 7.—[illegible] consisting of a mass-concrete centre, transversely curved at the [illegible] with [illegible] each side, formed with block work with flints, and carried down through the beach to a chalk foundation. This type of groyne was adopted upon the foreshore at Brighton. Six groynes were constructed in length [illegible] the average distance apart [illegible] being 710 ft. Some of the groynes at Brighton were built [illegible]

[illegible] suffer from the liability due to attrition of the shingle, causing the exposure of the reinforced metal [illegible] readily repaired as a timber groyne.

Groyne No. [illegible] has been [illegible] of Dover designed by Messrs. Walker and Burgess, and built about 1860-1. The materials used consisted of a core of Portland cement concrete, with Guernsey granite face-work in various sizes, roughly hammered for random courses, and [illegible] Medina cement. The [illegible] is of Aberdeen granite. It was found that the near-absorbent nature of Guernsey granite caused the [illegible] to fall out under the jarring nature of heavy seas, and subsequent pointing was substituted with ordinary cement mortar. At Hastings at the east end

of the foreshore, we have another example of concrete groyne, designed by Sir John Coode, and carried out from the shore into a depth of about 10 ft. at low water of spring tides. The top slopes seawards with a surface inclination of 1 in 9 at the outer end, this gradient having been found to correspond with the average slope of the Hastings foreshore under ordinary circumstances. Concrete blocks were employed faced with hard stone set in place for this work. The foundations were carried down to a level and sound



bed on the rock, and where deemed necessary the footing were protected from erosion by a concrete apron.

ROADS IN THE WESTERN FIGHTING AREA.

In a contribution from that acute observer "Eye Witness" published on Monday last, an interesting sidelight is thrown upon the road question as it affects the war in the actual fighting area. "It is difficult," says the writer, "for those who do not know something of the problem of maintaining an army in the field to realise what immense efforts and how great an amount of material are required to keep the roads in repair, especially under motor traffic. As has been already mentioned, one great difficulty of doing this in the part of France and Belgium in which we are operating lies in the fact that the paved portion of the roads is in most cases so narrow that vehicles cannot pass each other without going off it, and that the soft earth on each side is, in wet weather, soon churned up by the heavy lorries in use into a mass of mud upwards of 2 ft. in depth. It has been found necessary, therefore, to improvise some method of increasing the width of the hard surface of the roadway, so as to allow of traffic on each side. This is now being successfully done.

"Although the pave is one of the most ancient and durable forms of road, even it is broken up in time by the continual passage of heavy motor lorries. The stones get displaced, and water percolates into the foundation, which is often merely sand or chalk, and washes it away. Then, if there should be a frost after the surface is thus cracked, the moisture which has penetrated freezes and breaks it up still further. The consequence is that the pave itself needs continual attention."

The Ruislip-Northwood Town Planning Scheme.—We have received from Mr. W. Louis Carr, surveyor to the urban district council, copies of the Ruislip-Northwood town planning scheme and coloured map, which, we are asked to state, are obtainable at a charge of 6s.—1s. for the scheme and 5s. for the map. Communications should be addressed to Mr. Louis Carr at the council offices, Northwood, Middlesex.

LONDON ROADS AND TRAFFIC.

The need of prompt attention to the question of main arterial road from London is referred to in the annual report of the London Traffic Branch of the Board of Trade. Within the last year or two, says the report, some of the lines originally selected for new roads have been blocked by building developments, and no time is to be lost if other sections of roads on the outskirts are to be saved from the same fate.

The matter of the most pressing urgency is the co-ordination of road improvement and town planning schemes round London. The cost of improvement while development is in progress is but a fraction of the cost involved if road improvement has to be undertaken after the area is built over.

As regards congestion of the traffic in London, the greatest increase in the number of vehicles has taken place in the zone from 6 to 9 miles from St. Paul's Cathedral. Horse-drawn vehicles continue to be supplanted with remarkable rapidity by the mechanically propelled, and there is an increase in the number of street accidents. The total number of street accidents in London in 1913 was 25,839, as against 22,270 in 1912.

The increase in accidents is offset by the fact that people travel much more than they used to. In 1904 the journeys per head of the population were 150·5; in 1913 they had risen to 271·5. The rate of increase in journeys and in accidents is about equal. The proportion of fatal accidents is increasing rapidly, and this is due to the multiplication of motor vehicles. Motors are twice as likely to cause accident as horse vehicles, and the proportion of fatal accidents is three or four times greater.

The motor 'bus is still the most dangerous type of vehicle, but its fatal effect has largely decreased owing partly to the introduction of the side guards. Motor cabs and cars are the next most dangerous class. Electric trams come next, though their fatal effect is very low, owing to the efficiency of the life guards.

Road traffic continues to increase at the expense of the railways. Whereas in 1909 60 per cent of the total number of passengers carried went by road and 40 per cent by rail, in 1913 68 per cent went by road and 32 per cent by rail.

Local Government Board Appreciation.—At the last meeting of the Bishop's Stortford Urban District Council the Highways Committee reported the receipt of a letter expressing the Local Government Board's appreciation of the work which had been done in the district during its occupation by the troops. The Chairman remarked that the communication was highly gratifying, and a member observed that it showed that the surveyor (Mr. Robert S. Scott) had done his duty.

Works Projected by Local Authorities for 1915.

The Great War has had a [illegible] on a good deal of municipal work contemplated in these islands during the coming year. In particular building operations, owing to the [illegible] of materials and the [illegible] labour, have been [illegible] during the past few months, and even [illegible] as an inevitable result of the crisis. It is natural that road works and in particular main road [illegible] should be postponed, and [illegible] pleasure resorts [illegible] to the [illegible] of [illegible] and the [illegible] of building [illegible] will be [illegible] by the [illegible] of progress and enterprise at seaside resorts, under the [illegible] in spite of the [illegible] of the times, the [illegible] of the [illegible] and [illegible] growing requirements of the public. This is but a [illegible] of the [illegible] for 1915, [illegible] pages, but it would be incomplete if we failed to [illegible] our numerous correspondents who have so generously enabled [illegible]

Abergele and Pensarn (Mr. W. E. [illegible], engineer and surveyor to the urban district council).—[illegible] Parish Council, the [illegible] Pensarn will be [illegible]

Abersychan, Mon. (Mr. [illegible], M.I.M. [illegible], engineer and surveyor to the urban district council).—[illegible] Pontnewydd to Abersychan, estimated to cost £[illegible], [illegible] Parish Council, the [

be proceeded with, and several schemes for improving and widening portions of the main roads will be carried out. Further consideration will be given to the provision of public baths and junior secondary schools, and to the substitution of bridges and subways for the existing level crossings over the railway. Many new streets will be made up under the Public Street Works Act, 1892, and the existing horsed dust-carts may be replaced by electrically propelled vehicles.

Barnet (Mr. W. B. Chancellor, engineer and surveyor to the urban district council).—Several private street works will be executed; municipal offices and underground conveniences, together with thirty-two workmen's dwellings and flats, will be erected; a considerable quantity of tar-macadam and Trinidad asphalt will be laid down on the principal roads, and the town planning of Totteridge and Arkley will be proceeded with. The council will also have under consideration the sewering of Totteridge, and the putting down of an ejector station, refuse destructor and pumping station.

Barnsley (Mr. J. Henry Taylor, M.Inst.C.E., borough surveyor and waterworks manager).—It is not anticipated that there will be a considerable amount of public works carried out within the borough. There are several important projects in hand and in contemplation, but whether they will fructify into actual being is uncertain. The corporation have accepted designs for a new town hall, and the architect has the preparation of the specification in hand. The cost of the building will be anything from £25,000 to £30,000, including the furnishing. The site has been purchased at a cost of about £10,000, and the citizens are looking forward to the time when they will have a building worthy of the town in which to carry on municipal work. The two most important buildings now in progress in the town are the Sheffield Banking Company's premises and the new Alhambra Theatre. The latter is of a pretentious character, and will probably be one of the finest buildings in the district. Road widenings have been sanctioned by the Road Board, and are now being taken in hand at a considerable outlay. Numerous private street improvement works are in hand, and others will follow during the year, but to what extent it is not at present possible to say. There are also extensions of the waterworks sanctioned, but these will be delayed as long as possible under present circumstances. The building trade is very slack, and the prospects are anything but rosy. The construction of a soldiers' camp at Silkstone for the 1st Barnsley Battalion, at an outlay of about £11,000, is now practically completed.

Barnstaple (Mr. F. Y. Saunders, M.R.San.I., borough surveyor).—The year will be a very quiet one so far as this borough is concerned from the point of view of municipal constructive work. Nothing is projected beyond the ordinary routine work of road repairs. Respecting buildings, it is most probable the county council will erect the new science and art schools on the Strand site. The usual tar-painting of highways will be carried out—some 51,000 sq. yds.

Barrow-in-Furness (Mr. Arthur Rae, borough engineer and surveyor).—It is expected that the swimming baths in Abbey-road will be completed in the spring, at an estimated cost of £16,000, and that the erection of a new public library will be commenced, the cost of which is estimated at about £13,000. Two elementary schools now in course of erection will, it is anticipated, be completed at an estimated cost of £26,500, and it is expected that a new secondary school will be put in hand, at an estimated cost of £35,000. A further widening and improvement of Fairfield-lane, and the widening and improvement of a portion of Hollow-lane will be carried out, at an estimated cost of £1,625. The Vickerstown Park and land adjoining on Walney Island, a total of about 8 acres in extent, will be taken over by the corporation, and the laying out completed. Work in connection with the further laying out of the public park on the mainland will be put in hand, and the laying out of a small recreation ground on Barrow Island will probably go forward. The reconstruction of the road crust of Abbey-road with natural asphalt, and the completion of similar work in Duke-street will be executed at an estimated cost of £10,000. Street improvements will be made at the junction of Rampside-road and Roose-road; also at the corner of Holbeck-road. A complete plant for the manufacture of 500,000 cub. ft. of gas per day will be installed on the site of the new branch gasworks in the Salthouse district of the borough. The total amount of the borrowing powers obtained is £75,000. This work will be carried out jointly by the borough engineer and the gas and waterworks manager. Private street improvements and the reconstruction of ordinary water-bound macadam roads with tar-macadam, together with tar-spraying work, will be in progress as usual. An installation of Deacon's waste-water detecting meters will be completed at an estimated cost of £2,000. The supervision of this work will be carried out jointly by the borough engineer and the gas and water works manager. Permanent tripe-dressing and gut-scraping sheds will be erected at the public abattoirs, the estimated cost of which is placed at £1,700.

Basingstoke (Mr. F. Reginald Phipps, Assoc.M.Inst.C.E., F.S.I., borough surveyor and waterworks engineer).—There are no works of great importance actually decided on for 1915, but many matters are under discussion. The improvement or extension of the sewage farm is urgently needed, the billeting of over 5,000 soldiers during the winter having strained its capabilities to the utmost. The provision of covered swimming bath and slipper baths is being strongly advocated, as also is the erection of more lavatory accommodation throughout the town. The building of twenty-eight houses for the working classes is in progress, and will be completed about April, when the question of further building will be considered. About 10 miles of roads will be tar-sprayed, and various improvements carried out on main and district roads, one being the completion of [illegible] widening, for which a loan was obtained.

Batley (Mr. Oscar J. Kirby, Assoc.M.Inst.C.E., borough engineer).—Chief among the works to be done this year are the following, viz.: The tar-paving of about 3 miles of streets, extra sizes to the electricity generating station; the laying of an outfall sewer from the district of Howden Clough, Howley Beck, and Lamparside; the widening of Whitechapel-road from Mount Pleasant to the centre of the town, and five streets to be made up under the Public Health Act, see 150.

Bedale (Mr. T. W. Metcalfe, surveyor to the rural district council).—In addition to the ordinary routine work, several minor road improvements are contemplated. The question of extending the sewers at the village of Kirkby Fleetham is under consideration. It is not anticipated that anything of considerable importance will be undertaken during the ensuing year.

Bedfordshire (Mr. W. H. Leete, Assoc.M.Inst.C.E., M.R.San.I., county surveyor).—It is not anticipated that there will be any special works apart from the ordinary maintenance and surfacing-improvement works on main roads.

Belper (Mr. Robert C. Cordon, engineer and surveyor to the rural district council).—During the year 1915-16, in addition to the ordinary work on the 162 miles of roads, the following works are projected: Construction of sewers and sewage disposal works for the township of Crich, estimated cost £12,250; the erection of a bridge over the river Derwent at Alles[illegible] estimated cost of bridge, £8 if with £2,000 sewers and sewage disposal works in the parishes of Denby and Horsley Woodhouse, alterations to sewage disposal works at Mapperley; the construction of a new culvert at Kilburne, estimated cost £120; and improvement to several lengths of roads by widening and removing dangerous corners.

Bethnal Green (Mr. A. E. DARBY, ASSOC.M.INST.C.E., borough engineer and surveyor).—During the year the 1913-15 programme of road construction, amounting to £28,868, toward the cost of which the Road Board have made a grant, will be completed. Further reconstruction and carriageway to be carried out include the repaving with creosoted wood blocks of a portion of Hackney-road, at an estimated cost of £1,000. The widening and improvement of Columbia-road and also the widening of a portion of Hackney-road prior to the re-erection of buildings, plans of which have been approved by the London County Council. The council have received sanction to borrow the money for the laying down of a pulsometer pump at the sewage outfall works, which will include granite paving and road reconstruction works, and the strengthening of Twig Folly Bridge. The electrical substations in connection with the electric scheme. The installation of additional slipper baths in the public baths. The decoration of the town hall and offices. The depot stables are among the constructional works to be carried out. Preliminary plans are also in preparation for the new Carnegie Public Library, which is to be erected at a cost of £14,000.

Bexhill (Mr. GEO. BELL, ASSOC.M.INST.C.E., borough engineer and surveyor).—No work of any magnitude is at present projected in the borough for 1914. The work under consideration, which may or may not be carried out during the year, is a new permanent hospital scheme for the borough, the extension of sewer outfall beyond low water for a distance of about 400 ft., with necessary chambers to receive tanks, a surface water drainage scheme with storm-water overflow, on the Cooden estate, and several private street improvement works.

Bilston, Staffs (Mr. VINCENT TEALE, surveyor to the district council).—A commencement, early in the year, will be made on the Holyhead-road improvement scheme, towards which the Road Board have granted financial assistance. The installation of electrical power and new pumps, machinery at the sewage works and the extension of the tipping will be completed. Other schemes which will be taken in hand are the widening of the Wrenbury and Library buildings, fever hospital and cemetery; additions to the market hall; the provision of a public convenience for both sexes and the putting down of an electrical sewage pumping plant. Demolition of insanitary property is to be carried out. A scheme has been prepared for a hamlets scheme. The abolition of the pan and substitution of the water-carriage system of sewerage will be further extended. The council have revised their present scale of water charges and hope to issue the new early in the year. The duplication of the trunk water main from Goldthorn Hill service reservoir is to be carried out, the erection of a new [illegible] for is prominently before the council. Considerable improvements will be effected on the district roads, and experiments in tarmetting the [illegible] probably carried out. Mains, with [illegible] making in for the 1892 Act about 120,000 yds. of road and street [illegible] forms, and the usual repairs work will be done with as previously.

Birkenhead (Mr. CHAS. BROWNLOW, M.INST.C.E., borough engineer and surveyor).—Tenders are now being invited for the erection of a [illegible] at Thingwall. The council have under consideration the erection of an elementary school to accommodate about 900 pupils, and a large scheme for the building of houses for the working classes, and it is expected that the erection of these buildings will be commenced during the early part of the year. A considerable amount of renewal of street paving and sewer reconstruction will also be undertaken.

Birstall (Mr. T. H. HAILSTONE, M.I.M. AND C.E., M.R.SAN.I., A.I.S.E., surveyor to the urban district council).—In addition to the general routine work, the council have decided upon a town planning scheme, and maps Nos. 1 and 2 are now being prepared. It is also proposed to carry out sewer extensions, and to make up streets under the Private Street Works Act.

Birmingham (Mr. HENRY I. SMITH, M.INST.C.E., city engineer and surveyor).—Sewerage: Wylde-Erdington main sewerage; estimated cost £28,000 [illegible] Brook sewerage; estimated cost £17,000. Markets: [illegible] £4,000 [illegible] put in hand. Roberts-road sewer- [illegible] £4,000 [illegible] relief valley sewer across private land at Dogpool [illegible] during very heavy rainfall in Upper Pershore-road district. The question of enlarging the Hockley main sewer below Avenue-road is also a matter which might be brought up again at any time. Private Street Improvements: Grove Hill-road, Handsworth [illegible] £90. [illegible] Handsworth [illegible] £15. [illegible] Handsworth [illegible] £632. [illegible] Handsworth [illegible] £611. Pollard-street, Handsworth [illegible] £1,600. [illegible] King's Norton. Building Works: Police station, Bristol-street; new fire station, Aston; extensions [illegible] Lighting dept. [illegible] Coventry-street New-street Paving. Hall Green-road, Durax paving: High-street, Harborne, wood paving; Ledsam-street, granite and wood paving; Ryland-street, granite and wood paving; Booth-street, Hand-worth, granite paving. Widenings: Marsh-lane, Erdington; Brookvale-road, Erdington Harborne-road, Edgbaston; Lakey-lane, Hall Green; Lordswood-road, Harborne; Shattmoor-lane, Hall Green; Reddings-lane, Hall Green; Oxhill-road, Handsworth; Wellington-road, Handsworth; War- [illegible] road. [illegible] Perry-road and W... lane.

Blackpool (Mr. JOHN S. BRODIE, M.INST.C.E., borough engineer and surveyor).—The contemplated works include a new covered-in swimming baths for school children; an open-air swimming bath, 400 yds. by 200 yds., on the foreshore; two new bowling greens; two recreation grounds; three large underground con- [illegible] sumption sanatorium for thirty-six beds; the reconstruction of three main arterial roads; the widening [illegible] Bloomfield-road; the making up of over twenty new private streets; and the completion of the new North End Promenade extension.

Bognor (Mr. OSWALD A. BRIDGES, M.R.SAN.I., engineer and surveyor to the urban district council).—The popularity of this rising seaside resort has increased by leaps and bounds, and the urban district council are almost unanimous in a desire to keep up with its requirements, and to make it the one prominent ray of sunshine on the South Coast for visitors. They are consequently spending vast sums of money in developing the town. This year an important widening of the Marine-drive and promenade opposite Lansdowne Mansions, west of the pier, will be effected, at a cost of £9,000. This scheme entails encroaching upon the sea by going out 45 ft., to which there has been some objection, and the council therefore decided to call in an expert. Prof. Matthews, ASSOC.M.INST.C.E., late borough engineer of Bridlington, was consulted, and he agreed with the scheme in its entirety as drawn up by the surveyor. The new outfall scheme at the sewerage works will be commenced in March; it is estimated to cost £10,000. The provision of workmen's dwellings has had the council's attention for some time, and forty-one houses have already been erected in Sheepwash-lane and Grevilts-lane. A scheme for 150 additional cottages is about to be started. The rents are 4s. 6d., 5s. 6d., and 7s. 6d. The cheaper houses have only one living-room and scullery on the ground floor, and three bedrooms: the 5s. 6d. houses have a parlour, kitchen, scullery, washhouse on the ground floor, and three bedrooms upstairs, the 7s. 6d. houses are really small villas for mechanics, containing parlour, kitchen, scullery on the ground floor, three bedrooms and a bath-room upstairs. The cost of No. 1 cottage, let at 4s. 6d., is £150; No. 2, let at 5s. 6d., £206; No. 3, let at 7s. 6d., £280. The work of building is being done department-

ally under the supervision of the assistant surveyor, Mr. F. B. J. Stephens.

Bolton (Mr. E. Ll. Morgan, Assoc. M.Inst.C.E., borough engineer and surveyor).—Apart from the ordinary work, the department have in hand at the present time the widening of St. Helens-road, including the doubling of the tramway track between Hulton-lane and Four Lane-ends, and a new connecting road between Church-road and Chorley Old-road, the estimated cost of these two schemes amounting to £22,000. In addition, it is proposed to complete the improvement of Deansgate (one of the principal thoroughfares in the borough), and the widening and improving of Plodder-lane and Hulton-lane, at an estimated cost of £21,000, together with the making up of a number of private streets under sec. 150 of the Public Health Act, 1875, the cost of which is estimated at £15,000. It is also proposed to reconstruct the tramway tracks in Deansgate, Marsden-road, St. George's-road, Knowsley-street, Bridge-street, and Higher Bridge-street, at an estimated cost of £11,036. Extensions are proposed to be carried out to Astley Bridge cemetery, and the council have under consideration the provision of a boating lake and playing fields.

Boston, Lincs (Mr. G. E. Clarke, M.Inst.C.E., M.I.Mech.E., borough engineer and surveyor).—Owing to the war no large works will be carried out. The usual amount of tar-macadam will be laid, and a refuse destructor erected; otherwise expenditure will be curtailed as much as possible. Harbour and Dock. —The same remarks apply here. The new ice factory, transit sheds, hydraulic coal hoist, cranes and new sidings have been postponed. Since the outbreak of war Mr. Clarke has been engaged in many important matters in connection with the naval and military authorities.

Brecknock (Mr. B. L. Pritchard, surveyor to the rural district council).—A scheme of sewerage is to be carried through for the village of Llangorse, and a scheme of water supply for the village of Yscythrog is under consideration. The question of housing in the district is receiving special attention, the council having been called upon to provide additional houses at Senny Bridge, Talybont, and Cray.

Bridgwater (Mr. F. Parr, Assoc.M. Inst.C.E., borough surveyor and waterworks manager).—The works proposed to be undertaken by the town council during the ensuing year are a consideration of the water supply and an extension of the main sewers in the Chilton district. This, with the routine work in the repair and maintenance of roadways, footpaths, and maintenance of the property belonging to the town council, will embrace all the public works likely to be undertaken.

Bridlington (Mr. C. G. Bradley, borough engineer and surveyor).—The works proposed to be carried out in Bridlington during 1915 include the widening of Hilderthorpe-road, also of Forty-foot-road, and a portion of St. John's-street; the erection of a refuse destructor, the building of ten workmen's dwellings in Portland-place, the [illegible] of a portion of the wood blocks in High-street, private street works in several streets, and the laying of two new sewers in the borough.

Bristol (Mr. Lessel S. McKenzie, Assoc.M.Inst.C.E., city engineer). Contracts are in operation for the erection of one nursing block and two convalescent blocks for the treatment of tuberculosis for seventy patients, together with administration building, and also for the erection of a swimming bath and slipper baths. It is anticipated that extensive additions will be made at the fever hospital, also to the workmen's lodging-house, and a lodging-house will be provided for women. A ferro-concrete water-storage tank of 40,000 gallons capacity is also to be erected. A large amount of tar-spraying will again be carried out on macadamised roads, and a heating, drying and mixing plant has been ordered with a view to laying down bituminous roads by direct labour.

Briton Ferry (Mr. H. Alex. Clarke, engineer and surveyor to the urban district council). — The second housing scheme of sixty-two workmen's dwellings was completed at the end of last year. This will make in all 113 dwellings at a total cost of £28,735, which includes cost of land, sewer and road construction. Additional water mains have been constructed at a cost of £2,700, and many lengths of streets and secondary roads added, and also minor works of sewerage. The sanction of the Local Government Board has been received for laying out 6 acres of ground for a public park, at an estimated cost of £2,050. It is also proposed to extend the area of the public cemetery.

Buckfastleigh (Mr. Wilfrid J. Goode, M.I.M. and C.E., engineer and surveyor to the urban district council).—During the year the scheme for the erection of artisans' dwellings, for which a loan of £3,151 has been sanctioned by the Local Government Board, will in all probability be proceeded with. Extensions of the water supply now being carried out at Buckfast will be completed in the early part of the year, and further extensions are to be made in Oaklands-road. Street improvements, involving the demolition of cottages at Waterman Corner, will be dealt with, the Local Government Board having held an inquiry for sanction to this work. Tar surface treatment and macadam will be laid down more extensively.

Bucklow (Mr. R. Curtis Cordon, M.I.M. and C.E., highway surveyor to the rural district council).—In addition to the maintenance of 207 miles of paved and macadamised roads, various improvements are in prospect. It is anticipated that ferro-concrete bridges will be built at Dunham Massey and Mobberley, and a length of concrete tube culvert put in at Millington. Road widenings will be carried out in several townships, and lengths of surface-water drains are required. A large area of granite and grit sett paving and a quantity of tar-macadam will be laid during the year.

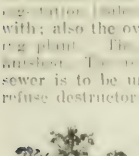
Burley-in-Wharfedale (Mr. Harry Riding, surveyor and inspector, gas and waterworks manager, to the urban district council).—The mechanical water-filtration plant contemplated last year is now nearly completed, and will be put into use early in the year, and further work in connection with the scraping of water mains will be taken in hand. During the Spring season about 35,000 super. yds. of tar-spraying will be executed, and the policy of substituting tar-macadam for ordinary water-bound macadam roads will be continued. Owing to the success of Glutrin-bound granite roads, the council propose to put down two further lengths. Further extensions at the sewage disposal works in the form of [illegible] beds are to be put in hand, and a new 12-in. outfall sewer, and a 1,000-gallon flushing chamber will be constructed in connection with the Allotment Gardens Society, who are about to sewer their property.

Burnham, Somerset (Mr. Wm. H. Crowins, [illegible] and area [illegible] to the urban district council). The principal works which will be carried out this year are low-level sewerage works in the new area recently added to the urban district. These works, which comprise stoneware pipe sewers, cast-iron rising and air mains, ejectors, compressors, and electric motors have just been commenced. Beyond the above and the ordinary routine work, nothing of importance is at present in contemplation.

Burnley (Mr. G. H. Pickles, M.Inst.C.E., borough engineer and surveyor).—The following is the list of the works projected for the coming year: New schools; new roadway through Towneley Holmes; tramway extension (lines and depot); private street works; main roads; new bowling green and [illegible] Scott Park; additions to sewers and sewage outfall works; new recreation grounds at Barden-lane and Habergham; formation of Queen Victoria-road; formation of roadway and culvert at Sept Clough; additional office at stationery stores; housing scheme; and town hall extension.

Burntisland, Fife (Mr. J. A. WADDELL, M.I.M. AND C.E., burgh surveyor and sanitary inspector).—The erection of new works on a site adjoining the burgh, by the British Aluminium Company, Limited, London for treating the raw material used in the course of their manufactures, is expected to cause great development and extension of the burgh. The works, as projected, are expected to cost several hundreds of thousands, and to provide employment for from 300 to 400 workmen. A start has been made with the preliminary works of construction, and the works are to be completed at an early date so that advantage may be taken of the disorganised condition of the German trade in aluminium to cut into some of the markets of the German manufacturers. In view of the demand for housing accommodation for the workmen, which will thus arise, the town council are arranging to feu about 7 acres of ground on Rossend estate, choosing the works for artizans' dwellings, and this will necessitate the construction of roads and the provision of sewerage and water supply for the estate.

Burton-upon-Trent (Mr. [illegible] LANSAM, M.INST.C.E., borough engineer and surveyor).—[illegible] the duplicate sewage rising main, [illegible] 21 inch to the sewage farm, reducing thereby [illegible] to convey the Cross Mills Steam, the river Dove, and the crossing of the North Staffordshire Railway will be undertaken at the [illegible] Extensions to the pumping station boiler [illegible] will be provided with; also the overhauling of the whole of the pumping plant. The extension of the town hall will be finished. The [illegible] Hay Dyke [illegible] sewer is to be undertaken, and the extension of the refuse destructor completed.



Bury, Lancs (Mr. J. ARMSTRONG SETTLE, ASSOC.M.INST.C.E., borough engineer and surveyor).—The work to be undertaken during the [illegible] during 1915 will be as follows:—Completion of extension of tramways at Rochdale Old Road and Walmersley; [illegible] to provide parks or recreation grounds; [illegible] hauling sheds, extension of the [illegible] and the construction of new [illegible] roads, improvements and widenings. An offer of a townsman to erect workhouses and baths has been accepted by the town council. Several important schemes are held in abeyance owing to the national crisis.

Buxton (Mr. F. LAWRENCE, engineer and surveyor to the urban district council).—The work contemplated for the year 1915 on the extension of the natural mineral water supply is [illegible] at a cost of £12,000. The [illegible] Buxton Baths with an [illegible] Bill [illegible] the re-instatement of Spring Gardens, [illegible] rock, [illegible] £1,200, and the [illegible] pleasure grounds. Schemes for the erection of public conveniences at various points in the district [illegible] Road widenings and improvements will be carried out, and the work of converting ordinary water-bound macadam roads to basalt tar-macadam will be continued. Private street improvements and the laying of kerbing are also to receive attention. The sewage filter-beds are to be emptied and re-furnished with new [illegible] machine-screened clinkers from the destructor works, being utilised for this purpose. It is hoped that during the present year Buxton will attain the position of a borough as a result of its petition for a Charter of Incorporation, with the adjoining urban district of Fairfield.

Cannock (Mr. ROBT. BANCHARD, engineer and surveyor to the urban district council).—The extension of the sewage disposal works, at an estimated cost of £12,270, is in course of construction, and will be completed by the summer. Various other contracts for the provision of sewers, road improvements, and underground convenience will be completed during the early part of the year. A housing scheme for the erection of forty-four houses will be carried out during the year. The provision of an isolation hospital is receiving consideration by the council.

Cambridge (Mr. JULIAN JULIAN, borough engineer and surveyor).—The programme of work for 1915 is not yet made, but it is anticipated that it will be chiefly concerned with maintenance work and special work already arranged. Cambridge will undoubtedly be financially hard hit by the war, and it is very unlikely that the council will embark on any such schemes at the present time. The following will probably be proceeded with during the next few months—viz.:—Additions to the guildhall and free library; footbridge over the Cam; several additions to the housing scheme; extension of shedding at the central depot; and one important street improvement (Jesus-lane).

Cardiganshire (Mr. F. E. OWEN, M.I.M.C.E., surveyor, [illegible] Division).—The chief works proposed in the [illegible] Division of the county are as follows—viz.:—The strengthening and surfacing with [illegible] the Llandilos to Aberystwyth main road, and extending from Gogenau village (8 miles from Aberystwyth) to Maes Bangor Arms hotel. The laying of 1¼ miles of tar-macadam on the same main road, commencing at the junction of the Aberystwyth borough boundary, and extending to the second milestone. It is proposed to obtain the tar-macadam, as well as the ordinary granite, from the Minffordd quarries of the Pwllheli Granite Company, Limited, of 44 High-street, Runcorn. The strengthening of the foundations of various sections of the road between Llangeithe and Talsarn with local stone. This road is off the beaten track of tourists. The widening and improvement of several dangerous and narrow corners. It is proposed to do away with the present hedges, and substitute post and wire fence, to allow of a better and open view. The strengthening in ferro-concrete of the weak arches of Penybont Bridge, and the improvement of the steep gradient leading thereto. This bridge is situated between Llanbadarn Fawr and [illegible] miles from Aberystwyth.

Cardiganshire (Mr. DAVID DAVIES, surveyor, [illegible] Division).—The projected works include strengthening and surfacing the road Cardigan to Cenarth, from Manorafon to Cenarth, about 66,000 super. yds.; new bridge at Rhydybeillen, and a new bridge at Rhyd. Both bridges will be in the rural district of Aberayron.

Carmarthenshire (Mr. R. W. JONES, M.I.MUN.E., county surveyor).—Further progress will be made with the four years' scheme of road reconstruction under the Road Board grants, which include widening, strengthening, and surfacing 25 miles on two of the chief road arteries in this division. The whole of the [illegible] be carried out by direct labour. Important road widenings are contemplated to be [illegible] between Bury Port and [illegible] A new bridge to replace the present double arch bridge is proposed to be erected on the mail road between Carmarthen and Bankyfelin. No [illegible] public buildings and police [illegible] necessary repairs.

Carshalton (Mr. W. WILLIS GOLDSMITH, M.INST.C.E., M.I.M.E.A., surveyor to the urban district council).—The council will during the ensuing year carry out the following works, viz.:—Widening and improving Woodmansterne-road (work for unemployed), at a cost of £1,100, [illegible] (contractor), building a pebble convenience in the Carshalton Park, for both sexes, at a cost of £600, four cottages at the Nightingale (keepers and employees), £1,100, seven roads under the Private Street Works Act, 1892, at a cost of £4,300; and the surface treating of all the roads in the council's area, about 200,000 sq. yds., at a cost of £1,000. The construction of an open-air swimming bath in the park is still under consid-

tion, the question of temperature being the burning subject.

Cheadle and Catley (Mr. F. R. GIBBINS, B.SC., ASSOC.M.INST.C.E., engineer and surveyor to the urban district council). Further lengths of resurfacing main roads will be taken in hand under Road Board grants. The whole of the main roads will be tar-sprayed in the early part of the year. Various private street works are contemplated, also road widenings and improvements in ordinary highways. A new bowling green at the recreation ground will be completed. Applications will be made for approval of town planning schemes for two areas—one of 4,232 acres, and the other of 471 acres.

Chelmsford (Mr. PERCIVAL T. HARRISON, ASSOC.M.INST.C.E., borough and water engineer).—During the past year the council have completed their housing schemes, totalling 144 houses, sunk two boreholes, 540 ft. and 357 ft. deep respectively, erected cottages for employees, and carried out extensions to sewers, water mains, and new street works. Works in progress, or already decided upon, for the present year include two new waterworks pumping stations—one at Galleywood and the other at Admiral's Park—slipper baths, extensive road resurfacing under the Road Board, wood block paving, several road widenings, extension of sewage farm, and the covering in of reservoir and filters. The year will probably see the completion of the plans for remodelling the sewerage and sewage disposal works of the borough. The council are also considering schemes for new municipal offices, a bridge over a river, new road connecting Springfield Ward with the railway station, refuse destructor, and town planning. It is proposed to promote a Bill in the next Session of Parliament for the acquisition of the gasworks. The billeting of large bodies of troops in the borough and neighbourhood has necessitated the carrying out of much work in connection with water supply and sanitation.

Cheltenham (Mr. J. S. PICKERING, M.INST.C.E., borough surveyor and water engineer).—The corporation are making a special effort to bring before the public notice the features of the town as a health resort and spa, particularly in view of the German and Austrian spas being closed to the British people. A Traders' Association has been formed, and they are bearing the expense of a band which performs daily at the Central Spa. A contract has been entered into between the corporation and the United Chemists' Association, Limited, under which the corporation supply mineral water from their wells, which the company concentrate and bottle as an aperient. A large demand has already been made for the supply of this water throughout the country, and early in the new year the pumping plant will have been completed ready for supplying the water. The new municipal offices are nearing completion, and will be ready for occupying in the autumn of 1915. The new sewage purification works have been carried out at a cost of about £40,000, and will be in full operation early in the year. The laying of a new trunk main to improve the pressure of water in the Leckhampton district, a distance of about a mile, is to be proceeded with. The committee have decided to lay a further area of 6,000 sq. yds. of wood paving in Lower High-street. The ordinary water-bound method of road construction has been almost abandoned, and tar-macadam construction substituted. This process will be further extended during the year.

Cheshunt (Mr. J. E. SHARPE, engineer and surveyor to the urban district council). The question of the water works will engage the consideration of the council. The yield from the existing well and pumping station is not sufficient to meet requirements, and a large quantity of water has to be bought in bulk from the Metropolitan Water Board. The question of providing a new source of supply by sinking a new well, and the erection of a new pumping station, will no doubt be considered. The resurfacing with a bituminous carpet of such portion of the London and Cambridge main road which lies within this district will probably be undertaken. This is part of the scheme for improving the surface of certain trunk roads in the county, and leading to London. The area in this district which will be dealt with is about 60,000 super. yds. During the coming year it is intended to make some provision for small-pox. A site has been acquired, and probably a hospital of a temporary character will be erected.

Chiswick (Mr. EDWARD WILLIS, ASSOC.M.INST.C.E., F.S.I., M.R.SAN.I., engineer and surveyor to the urban district council).—The effect of the war has been to diminish the work that the council would probably have undertaken, but it is anticipated that upwards of a mile of highways will be converted from granite surface to creosote softwood paving, an estimate of £20,000, including assistance from the Road Board, having been already approved. Several thousand yards of surface-water sewers will also be added to the system which has already been sanctioned, the idea being to carry out extensions each year until the drainage scheme has been completed. One or two private streets will be made up during the year, most of this work having been brought up to date in past years. One large refuge will probably be provided in the High-road, as the tramway and omnibus traffic have considerably increased. A very extensive widening in Burlington-lane is being carried out with raised rockeries on each footpath, planted with trees and shrubs. Further widenings under the Chiswick Urban District Council Act, 1911, will also probably be executed during the year to the extent of several thousand pounds. It is intended to further extend the laying out of the Commons, but not to any very great extent. Somewhat extensive alterations will be carried out at the Holme Court Industrial School, and it is also probable a new school or extensive alterations may be required. The most important matter now before the council is the proposal to form an extensive golf course with a promenade for upwards of half the river frontage of Chiswick, but it is feared the war will prevent this improvement being effected at present.

Chorley (Mr. GEORGE H. HOPKINSON, borough surveyor). The works projected include reconstruction of part of the main road (Bolton to Preston); granite setts on concrete foundation, estimated cost £4,700; completion of Tatton recreation ground; and private street works for several streets and passages, for which Local Government Board sanction has been obtained to a loan of £3,963. Other works will probably be affected by the war, and it is difficult to forecast the improvements that may be dealt with.

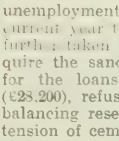
Clacton-on-Sea (Mr. D. J. BOWE, engineer and surveyor to the urban district council). During the past year, which has been one of much progress in this seaside resort, a number of interesting works have been completed, chief among them being the bandstand and entertainment pavilion, which was carried out by administration by the surveyor, at a cost, the building alone, of £13,000. The Pier Approach property has been demolished; the cliff sloped, planted, and formed into rock gardens, and the East and West Promenades linked together by a ferro-concrete bridge of 60-ft. span, and 20 ft. between the parapets, at a cost of £6,000. This bridge is in Early Italian Renaissance, and is a unique example of ornamentation in ferro-concrete construction. During 1915 two subsidiary concrete groynes are to be built, at a cost of £2,500, thus completing the scheme of the surveyor four years ago of groyning the whole of the foreshore. This work is amply justified by the results now being obtained. The sea wall and promenade is to be extended in the spring to the west boundary, at a cost of £9,150, while a bathing chalet, to accommodate eighty bathers of both sexes, will be constructed at the east, at a cost of £1,000. Several roads will be made up under the Private Street Works Act, and the council will consider a full report of the surveyor on the sewerage system of the district, including a new outfall sewer to the extreme west of the district.

Cleethorpes - with - Thurnscoe (Mr. C. H. WAITHMAN, ASSOC.M.INST.C.E., M.I.M. AND M.U.E., engineer and surveyor to the urban district council).—During the year the Cleethorpes sewage disposal scheme will probably be completed. This work, which was commenced in April, 1911, will probably cost about £75,000. The scheme provides for the carrying of about 2 million gallons per day from Cleethorpes to Thurnscoe, a distance of about 7½ miles, by means of a 12-in. to 24-in. pipe sewer. At Thurnscoe a concrete storage tank, with a capacity of 1,000,000 gallons, the reconstruction and lengthening of the southern outfall, and the building of the pumping station and their equipment are being carried out. The whole of this work has been carried out under the control of the consulting engineer, Mr. J. S. Allen, M.INST.C.E. The new refuse destructor was commenced in May, 1914, and is now in operation. The plant, which is by Messrs. Manlove, Alliott & Co., Nottingham, consists of four cells, so designed that they form two separate units, with provision for the ultimate construction of two additional cells. The cost of the building, cells and shaft is £6,260. The council are constructing a concrete inclined roadway by direct labour as a distress relief work at an estimated cost of £250. The projected works for 1915 include the widening and improvement of three of the most important roads in the district, at an estimated cost of £10,000. This work is intended to act as a distress relief work, and will probably be commenced in February. The Kingsway Pavilion is to be improved, at an estimated cost of £[illegible]. A [illegible] and [illegible] and a [illegible] road. A bandstand is to be erected in the Sydney Park. The council have also under consideration the question of the provision of a marine lake (20 acres of water surface), with gardens, sea wall, swimming baths, and boat-house. The extension of Sydney Park by the addition of 6 acres, and the laying out of the Central West Recreation Ground [illegible] will probably be carried out during 1915. The council have just received sanction to a loan of £10,000 for the purpose of laying electricity cables in the main streets.

Clydebank (Mr. [illegible], burgh surveyor and master of works).—The second of the two new bridges erected over the Forth and Clyde Canal is expected to be opened for traffic early in spring. Two widenings of Kilbowie-road to 60 ft. are contemplated. The [illegible] opposite Singer's works, is [illegible] yds. long, and entails the erection of a retaining wall in reinforced concrete, and the widening of three railway bridges at a total cost of £4,500. The second is at the north end, near the burgh boundary, and is over 600 yds. long. No great engineering problems are met with here, a general improvement of the line and gradients of the road suitable for the proposed tramways to Duntocher being the main work. This widening is expected to cost about £2,500. Other new roads and widenings have been proposed in connection with the provision of work for unemployed, including the widening to 50 ft., and raising of Park-road to Duntocher-road, the continuation of Stevenson-street to Albert-road, and the formation of three of the roads proposed under the town planning scheme. It is also proposed to cover in the Boquhanran Burn by the construction of a ferro-concrete culvert. Plans have been prepared in connection with the housing scheme of the corporation, the houses comprising a room and kitchen, and three rooms and kitchen, with bath and scullery. Owing to the great scarcity of houses in the burgh, an early start is expected to be made with the construction. The proposed sites, which are in the Radnor Park district, are very healthy, and command a fine view of the surrounding country. The population of the burgh is 45,000.

Colchester (Mr. HAROLD COLLINS, ASSOC.M.INST.C.E., borough engineer and surveyor).—The substitution of wood paving for water-bound and tarred-macadam and granite-sett paving in High-street, Head-street and Crouch-street will be completed in the early part of the year. The scheme for the replacement of the existing water-bound macadam in London-road, Lexden-road, Crouch-street (part of), East-hill, East-street, Ipswich-road, and Harwich-road with bituminous macadam will be taken in hand, a grant of £[illegible] has been made for the work by the Road Board through the county council. The [illegible] Hythe Quay and [illegible] Colchester, with a [illegible] has been carried out at a cost of about £2,000. By [illegible] this work [illegible] £1,000 [illegible] the [illegible] of [illegible] the [illegible] have been completed, but has been [illegible] owing [illegible] Temporary [illegible] have been erected by the War Department for many thousands of soldiers, and the drainage arising [illegible] required the [illegible] for planning and the carrying out of the work. This work will very shortly be completed. [illegible] Temporary schools [illegible] wards to [illegible] utility [illegible] have also been designed, and are now nearing completion. The cost will be about £1,450, and will be borne by the War Department. At the end of the war these wards will be taken over by the council on an agreed percentage of the first cost. In addition, a new twenty-two-bed scarlet-fever block, twelve-bed tuberculosis sanatorium and administrative block extension, together with laundry alterations, will shortly be commenced at an estimated cost of £4,000. Numerous plans have been prepared for road widenings, in order [illegible] in case of distress through the war, and these will be put in hand as required. It is also hoped to obtain a grant from the Road Board for [illegible] plant and [illegible] the [illegible] of tar-macadam. The question of the provision of public swimming and slipper baths is to be taken into consideration. Various [illegible] in the [illegible] are to be carried out.

Colne (Mr. T. H. HARTLEY, borough [illegible] and [illegible]). Among the works projected for the year 1915 are the following: [illegible] The [illegible] tration for the purchase of the tramways having been held and the award given, it is proposed to relay several lengths of track. Town Planning.—A [illegible] Board [illegible] to be [illegible] regard to the area for which the corporation are seeking permission to prepare a scheme. All the preliminary formalities have been observed. The area in the present scheme is about 800 acres. Main Sewers and Sewage Disposal Works.—Further extensions to the bacteria beds are proposed in the way of providing some percolating filters to cope with the increased flow of sewage owing to growth of population, and further extensions to sewers are also in hand. Private Street Works.—This work is to be continued out of a loan of £21,000 already sanctioned. Water-carriage Scheme.—Works of this kind are also to be continued out of the loan sanctioned by the Local Government Board of £4,470. Recreation Grounds and Parks.—A scheme has been prepared, at an estimated cost of £5,680, for the laying out and equipping of the Judge Fields Recreation Ground, and a scheme for a public park is also in hand. These and other works are proposed in order to find work for operatives who are thrown out of employment in consequence of the war. Tar-spraying and Tar-grouting.—This work will also be continued during the year on several [illegible] of roads [illegible] constructed.



Colwyn Bay (Mr. WILLIAM JONES, ASSOC.M.INST.C.E., surveyor and water engineer to the urban district council).—Most of the works enumerated to be carried out during 1914 are still in hand and nearing completion, and have been a great boon in reducing unemployment throughout the district. During the current year the following works are expected to be further taken in hand, and the council will have to require the sanction of the Local Government Board for the loans: New electricity generating station (£28,200), refuse destructor (£7,000), new service and balancing reservoir to contain 11,000,000 gallons, extension of cemetery, and the sewering of the western portion of the district (£11,090). The council have also decided to resurface with tar-macadam practically the whole of the main roads in the district, the work being carried out in conjunction with the widening of the Abergele road, and the extension of the tramway track to Old Colwyn, the estimated cost of the work being £2,500. Another very important requirement of the district which will undoubtedly be taken into

consideration shortly by the council is the providing of a public abattoir. The council are in negotiation with landowners abutting on Llanrwst-road for the land necessary to widen the same, and it is expected that this work will be satisfactorily completed in due course at an estimated cost of £1,500. The continued progress and development of the district will necessitate during the year the making up by the council of several streets under the Private Street Works Act, 1892, the extension of many of the public sewers, and the laying of several new water mains.

Congleton (Mr. J. H. WALLERS, borough surveyor).—The works projected are various private street works and road widenings on some of the main roads. Main roads and other roads are to be sprayed with Tarco. The council have instructed the borough surveyor to proceed with the plans for the erection of an elementary school to accommodate about 350 mixed scholars. During 1914 several lengths of water mains were scraped. This work has been so successful that the council have given instructions for further lengths to be cleaned. Alterations to the sewage outfall works are in hand, including the construction of larger humus tanks, sludge lagoons, and sludge pumps driven by Crossley gas engines.

Conway (Mr. F. A. DELAMOTTE, ASSOC.M.INST.C.E., borough engineer and surveyor).—The erection by the contractors of the hut encampment for the two "Pals" Battalions of the Lancashire Fusiliers will be completed at an early date. The council and Board of Agriculture and Fisheries will bring to a conclusion the work of constructing their mussel purification tanks, which will form an interesting study, this being the pioneer establishment in Great Britain of a purification scheme for polluted mussels. The following are among other schemes before the town council: The construction of forty-eight cottages for the working class; two public cemeteries; making up of private streets; reclamation of waste land; construction of sea walls; a scheme for planning out part of the Morfa estate; and several other lesser schemes.

Coventry (Mr. J. E. SWINDLEHURST, M.INST.C.E., city engineer and surveyor).—Many works of an important character are contemplated in Coventry for the year 1915. These comprise the reconstruction of the drainage to a residential district known as Stoke Park, service reservoir, Coundon; laying out of Gosford Green as park and recreation ground, including bandstand; new street across Gosford Green; public conveniences, both above and under ground; extensions to swimming baths; several schemes of workmen's dwellings, some of which are in hand; new pavilion, Spencer Park Recreation Ground; while it is probable that the contract for a public abattoir will be let. In addition to the foregoing, it is anticipated that the water purification plant, Whitley, which is now in hand, will be completed, as will also the following schemes: Sewerage, Holbrooks-lane and Lythalls-lane; new depot for highways department, Leicester-street; numerous street improvements; and bacteria beds at the sewage farm, Baginton. The question of paving the back passages at the rear of houses, annexation, a municipal lodging-house, and town planning, are all matters which have received attention, or will receive attention in 1915.

Croydon (Mr. GEORGE F. CARTER, M.INST.C.E., borough engineer, surveyor and water engineer).—A covered service reservoir to hold 10,000,000 gallons is now under construction by administration. A new well is being sunk at the Waddon works, and a tender for the pumping plant has been accepted. Cast-iron mains, from 15 in. to 27 in. diameter, are being laid by direct labour. New sewage works are being constructed at the South Norwood farm. Tanks are completed and the sprinkler-beds well in hand. The council passed a scheme of extension of the borough hospital to cost £51,000, and the plans and estimates are about to be forwarded to the board. Two underground lavatories will be constructed.

Croydon (Mr. [illegible] J.P., F.S.I., sanitary surveyor, M. Rem. C.E., surveyor to the rural district council).—This important rural district will come to an end as a rural district on March 31, 1915, and will be divided into three large urban districts under an Order made by the Surrey County Council. (1) Mitcham Urban District, consisting of the parish of Mitcham, having a population of 30,000, and an assessable value of £134,000. (2) Beddington and Wallington Urban District, consisting of the northern portion of the parish of Beddington and the hamlet of Wallington, having a population of 14,000, and an assessable value of £120,000; (3) Purley and Coulsdon Urban District, consisting of the parishes of Coulsdon and Sanderstead, the southern portion of the parish of Beddington, and the south-eastern portion of the parish of Woodmansterne, having a population of 23,000, and an assessable value of £205,000. The parish of Addington will be attached to the Godstone Rural District, and the remaining portion of the parish of Woodmansterne to the Epsom Rural District. Among the works projected for the year 1915 are: In Mitcham, the widening and resurfacing of Streatham-lane and the reconstruction of the sewage disposal works; in Beddington and Wallington, the completion of the widening of Woodcote-road; and in Purley and Coulsdon, the completion of the widening of Smithambottom-lane, the construction of a new surface-water outfall sewer, and the resurfacing of the Brighton and Godstone roads. Various private street works will be carried out in all the districts, and the usual quantity of tar-spraying will also be done.

Cumberland (Mr. WILLIAM FINCH, county surveyor and bridge-master).—During the year several extensive improvement works will be in progress on the county main roads and bridges, in addition to the resurfacing and repair work. Many sections of county main roads will be surfaced with tarred granite macadam, and the surface treatment with tar on water-bound granite roads continued on a more extensive scale this year. Further progress will be made with the scheme of resurfacing those county main roads which have hitherto been surfaced with inferior local stone with first-class material. The estimated total cost of the surface improvement works for the year is approximately £30,000. Many applications have also been received from urban authorities within the county for grants towards the extra cost of surface improvement works on the county main roads within their area, and for other road improvements. It is anticipated that the new ferro-concrete bridge at Metal Bridge, on the Glasgow main road, costing over £17,000, and which is now under construction, will be completed towards the end of the year, and also the new 80-ft. span stone bridge in the Alston district, costing £3,500. An extensive road improvement will be carried out at Rowrah, at an estimated cost of £7,000, involving the erection of a new bridge over the London and North-Western Railway. The widening of the district road from Keswick through Borrowdale to Seatoller is being carried out by the county council, at an estimated cost of £7,500, which road will become a county main road upon completion. Several other smaller main road improvements will also be carried out during the year [illegible]

Darwen (Mr. R. W. SMITH-SAVILLE, ASSOC.M.INST.C.E., A.M.I.E.E., borough engineer, surveyor, water and tramways engineer).—The general trade in Darwen, in all its branches, except the iron-smelting works, has been very depressed since the commencement of the war, and in the weaving industry there has been a certain amount of distress. In depressing circumstances such as these it will be seen that it is not advisable to enter upon many new [illegible] especially as the cost

[illegible] completed important [illegible] work [illegible] at a cost of £12,000. On account of losses on the building trade the Health Committee have decided to proceed with the [illegible] at a cost of £6,500 [illegible] The works of [illegible] extension and improvement [illegible] a total expenditure of [illegible] Water Engineer [illegible] [illegible] [illegible]

certain roadways will be put in hand, for which a Road Board grant has been obtained. The latter questions of sewage disposal and additions to water supply have again engaged the attention of the council, and reports on both subjects have been received from a consultant. The erection of a front wall and railing to replace a temporary structure at new cemetery and the erection of a caretaker's lodge are projected. The smaller works include a small fire brigade station, installing additional tar-macadam plant, additions to street and park planting, alteration to exits of the town hall concert hall, reclamation of waste lands, and erection of further sanitary conveniences.

Durham (Mr. John T. Pegge, ex-president Inst.Mun.E., A.S.I., city engineer).—Retrenchment and great care have to be exercised during this year. In view of the probability of distress, a scheme is sanctioned by the county council to spend some £20,000 on a new road to open up the Elvet end of the city, towards Shincliffe, on the Stockton and Hartlepool road. The county council is also going to improve considerably the Crossgate "Peth" for motor vehicular traffic. The city council find it necessary to strengthen the foundations of considerable lengths of roads to carry the motor-bus traffic. An improvement on the Great North road is contemplated by setting back the wall of Wharton Park, and building a shelter for motor-'bus passengers, and a public convenience. A further portion of the river bed—about 1½ acres—is to be enclosed by means of a ferro-concrete wall, and improvements to the town hall and corporation properties are necessary.

Ealing (Mr. W. R. Hicks, Assoc.M.Inst.C.E., borough engineer and surveyor).—The following is a list of the works contemplated during the year: New school for 1,250 children at South Ealing; laying of about 1½ miles of 24-in. surface-water culvert; extension of destructors; erection of additional workmen's dwellings (twenty); erection of [illegible] widening of Hangar-lane; various public improvements, and the laying of some 2 miles of carriageway with tarred slag; the usual private street works; [illegible] of central depot.

Eastbourne (Mr. A. Ernest Prescott, borough engineer and surveyor and surveyor to education authority).—The carrying out of important and extensive works during the present year depends largely on how soon the present hostilities are brought to a close. The largest scheme at present in contemplation is the construction of a coastal road between Eastbourne and Bexhill, detailed plans of which have been nearly completed. If satisfactory arrangements can be made with the interested landowners, and substantial assistance can be obtained from the Road Board, who already look favourably on the proposal, this scheme will soon become an accomplished fact. The estimated cost is £100,000. Additional tennis courts are being laid out at the east end of the town. The surface-water drainage scheme will also be completed during the present year, and plans for a large open-air sea-water bath will also be prepared. Apart from these special works, the ordinary routine work will follow its usual course, and special attention will be given during the summer months to the construction of dustless roads and re-surfacing.

East Grinstead (Mr. W. E. Woollam, M.I.M.&C.E., M.R.S.I., engineer and surveyor to the urban district council).—The works proposed comprise making up [illegible] several private streets, road widenings, laying out new cemetery, [illegible] which is nearing completion.

East Preston (Mr. Chas. W. Leney, M.I.M. and C.E., inspector, highway surveyor and building surveyor to the rural district council).—During the early part of the new year it is proposed that £1,000 shall be spent on sea defence works in the parish of Rustington, if the approval of the Local Government Board and the Board of Trade can be obtained for the scheme, which includes four timber groynes and a short length of concrete retaining wall. An application has also been made to the Local Government Board for powers to borrow £800 for the erection of four workmen's cottages in the parish of Angmering, by way of an experiment, as it is intended that they shall be self-supporting financially. If the scheme is successful, it is anticipated that more houses will be built. The loan will not include the cost of the ½ acre of land which, in this case, has been presented to the council free of all charges by the Duke of Norfolk. The work of widening and strengthening the roads will be continued, and the use of granite and tar-spraying will be extended in place of flints, which is the local material.

Eccles, Lancashire (Mr. Thomas S. Picton, M.I.M. and C.E., borough engineer and surveyor).—The main drainage scheme, estimated to cost £60,984, was commenced last summer, and good progress has been made with Contract No. 1 for the construction of about 1,127 lin. yds. of 7-ft. 6-in. circular storm overflow sewer, and Contract No. 2 for the 6-ft. by 5-ft. outfall sewer, catchpit, and machinery. These two contracts will be completed early in the year, when contracts 3 and 4, for the construction of about 506 yds. of 7-ft. 6-in. by 5-ft. and 444 yds. of 4-ft. by 2-ft. 8-in. egg-shaped sewer will be commenced. The making up of private streets will be continued as in the past, and ten front streets and seventy-three passages will be completed during the year. Application will be made to the Local Government Board for sanction to borrow the sum of £85,686 for the south-east Eccles area scheme. This comprises the purchase and demolition of about 7 acres of insanitary property, and the erection of workmen's dwellings on the site, the widening of [illegible] road and construction of new roads. The corporation are also contemplating erecting twenty-four houses on vacant land behind the Carnegie Library. Sanction has been obtained for the borrowing of £813 for replacing grit setts in Cromwell-road, opposite the hospital, with granited-rock asphalt. The revision of the 1/500 ordnance survey of the borough will probably be undertaken during the year.

Erith (Mr. Harold Hind, surveyor to the urban district council).—The [illegible] works as preceding, and it is hoped to [illegible] Dumont. It is proposed to erect an additional ward, and extend the [illegible] of the isolation hospital. Sewers [illegible] be made up under the Private Street Works Act, 1892, also certain road improvements are to be carried out. A tar-macadam mixer is being purchased, and a number of water-bound macadam roads are being resurfaced with tar-macadam. A new filter-bed is being erected at the sewage disposal works. Extensions to sewers are also contemplated.

Evesham (Mr. Henry S. Harvey, borough surveyor).—A scheme has been prepared for the erection of fifty workmen's dwellings, but it has not yet been definitely arranged to commence the work. Extensions [illegible] isolation hospital.

Exeter (Mr. Thos. Moulding, [illegible] engineer and surveyor). There [illegible] proposal before the council [illegible] constructing and improving the sewage disposal works of the city, which must be [illegible] during the year. The [illegible] the water. The [illegible] during the next twelve [illegible]

tramway line, and the question of the provision of sheds, &c., has to be considered. The question of the refuse destructor is again coming up, and it is expected that the work will be commenced during the coming year. Sewage street improvements and widening which are in hand will be completed. Several blocks of artisans' dwelling will be commenced during the year. These dwellings would probably have been completed had it not been for the war. The above, taken together with the usual routine work of the department, will keep the city engineer's department pretty busy during the year.

Farsley (Mr. HAROLD H. NORTH, M.I.MUN.E., engineer and surveyor).—The year 1915 promises to be a busy one so far as municipal works are concerned. The following is a list of work that will be carried out during the year, and estimates prepared by the surveyor:—Extending at the sewage disposal works the wall (now in progress), coke breeze roughing filters, filtration beds and sprinklers, humus tanks and sludge filters. Alterations will be effected at the present screening chamber. It is also proposed to lay out the gardens in front of the council offices, and to carry out various private street works and road widenings, and other improvements. Resinite and Glutrin have been used on tarred roads with good results on very heavily trafficked roads and roads with steep gradients. A small length of road is now being laid with Vianex as a binder.

Foleshill (Mr. A. E. NEWEY, M.S.E., engineer and surveyor to the rural district council).—Plans have been prepared for thirty workmen's dwellings in Bedworth and thirty in Foleshill, and a local Government Board inquiry has been held. These houses will be commenced early in the year, tenders having been accepted for the work, amounting to £14,250. At Bedworth sewage works the council have in course of construction and nearing completion detritus tanks, and sludge lagoons. The filter-beds will be reconstructed afterwards. At the waterworks a new borehole has been sunk, and it will be necessary to put down a water softening plant and storage reservoir. Four streets have been made good under the Private Street Works Act, 1892, and it is intended to proceed with the same. The widening and strengthening of the roadways is constantly being carried on owing to the increasing heavy motor traffic to collieries and brickworks.

Frimley (Mr. T. CLEMENT JONES, engineer and surveyor to the urban district council).—No new works will be carried out during the ensuing year owing to the railway company being unable to deliver material, and to the total lack of labour and haulage, nearly all at present employed by War Department contracts.

Frome (Mr. F. W. JONES, ASSOC.M.INST.C.E., surveyor and water engineer to the urban district council).—The chief works projected for 1915 are the installation of a suction-gas driven pumping plant at the present pumping station, the extension of the sewerage system at Marston-road, and a street improvement scheme at Broadway. Further trials will be made with granite and Trinidad asphalt in recoating highways.

Gillingham, Kent (Mr. J. L. REDFERN, A.R.I.B.A., borough surveyor).—In the coming year it is proposed to widen Watling-street to a minimum width of 40 ft. for a distance of a little over a mile. Widenings will also take place in Woodlands-lane, Heathfield, Hempstead road and Bridge road. The usual amount of tarring and surfacing will be done. Fifteen workmen's cottages will be erected in Toronto road, and six in Middle-street. A new mortuary, a public convenience above ground, and a covered swimming bath, 100 ft. by 40 ft., with a few slipper baths attached, are to be erected. A considerable amount of sewering, both foul and surface, will be carried out, and a 36-in. intercepting sewer for storm water will be constructed to relieve the district near the Gillingham Gate of the Dockyard.

Glemsford (Mr. H. L. TAYLOR, surveyor to the urban district council).—The only new work in contemplation at present is the filtration of the water supply. There is a large amount of iron in the water, which offends the nose, eye and taste of the consumers. Other work will consist of the gradual improvement of the roads and footways as occasion offers.

Gloucester (Mr. RICHARD READ, ASSOC.M.INST.C.E., city surveyor).—It is proposed to construct two new roads and widen and improve four others. The contract has just been let for a tuberculosis hospital, and the council are completing the new sewer outfall with tunnel and syphon under the river Severn. The second borehole, 18 in. diameter, in the new red sandstone at Ketford, about 16 miles west of Gloucester, is also being proceeded with, in order to obtain an additional supply of water which will be pumped into the existing reservoir at Haresfield, 9 miles from Gloucester. The council are considering a scheme for building [illegible] the working classes.

Glyncorrwg (Mr. W. P. JONES, engineer and surveyor to the urban district council).—The Afan Valley extension is now proceeding, and is estimated to cost £10,000 in connection with which a contract has been let to Messrs. [illegible] The contract includes a well, 40 ft. deep, and 10 ft. diameter. The sewer also completed will form a connection through the Afan Valley Main Sewer. The Afan Valley main trunk sewer having been completed, application will be made to the Local Government Board for a loan towards the subsidiary sewers. The council have under consideration a scheme for providing a small-pox hospital, and a scheme to [illegible] supply of the Glyncorrwg Colliery Co. [illegible] supply.

Godmanchester (Mr. C. F. MAYFIELD, surveyor and inspector to the urban district council).—The council have the estimates prepared in March. It is likely that portions of the main roads will be reconstructed with a bituminous binder on the grouting system. A proposal for filling the existing sewer-flushing tanks by means of a windmill will be considered. The works in hand this year include the resurfacing of the main street with 2½-in. granite, and grouted with Clare's Bi-Tarco for a binder; also a new river wall, built in blue Staffs bricks and cement, with concrete posts and iron tubing as a protective fence on the top. The wall acts as a retaining wall for the road, and is built high enough to prevent the flooding of the town.

Cosport and Alverstoke (Mr. HERBERT FROST, engineer and surveyor to the urban district council).—The special works so far projected for the forthcoming year are: The making up of several private streets; construction of a new [illegible] small-pox hospital; reconstruction of the ferry landing, Portsmouth Harbour, for which a new scheme is to be called for; extension of Tarmac surfaced and tar treated roads; extension of elementary school buildings; rebuilding of sea wall; and some probable laying out and improvements of recreation grounds; the completion of sewage sea-outfall; completion of scheme for the drainage of old properties [illegible] connected up with the main sewerage system, and the purchase of a motor fire engine, and probably motor lorries for haulage and other works.

Crimsby (Mr. H. GILBERT WHYATT, M.INST.C.E., borough engineer and surveyor). During the past twelve months the construction of public [illegible] has been carried out in the [illegible] to the value of £3,000, exclusive of the Welholme-road level crossing, which has been completed, at a cost of about £1,100. The construction of new streets on the Freemen's estate has also been carried out at a cost of about £3,200, the estimate being £3,639. The construction of the Weelsby-road and Bargate Boulevard, at a width of 72 ft., has been commenced, and is now in hand, the estimate being £19,000, towards which the Road Board has given a grant of £5,000. The subway under the railway at Weelsby-road (which will necessitate the raising of the lines) is now under negotiation with the railway company, the estimated cost being from £10,000 to £12,000, and, as soon as the details are settled, application will be made to the Local Government Board for their sanction. The Town Planning Committee has decided upon three town planning schemes, and the office staff is being augmented in order to cope with the extra work. Schemes are now being considered

for a tuberculosis dispensary with maternity clinic adjoining, and also for a tuberculosis hospital, and this will be laid before the Local Government Board within the next two months. As regards the tuberculosis sanatorium, negotiations are now proceeding with the three divisions of the county of Lincolnshire for a joint sanatorium, contributed to by the various authorities, and a site has been provisionally agreed upon. Sanction has been received from the Local Government Board for the construction of new sewers and culverts in the Ainslie-street and Wintringham-road district, at an estimated cost of £7,948; tenders were advertised for, but, after being sent in, the contractor to whom the work had been awarded asked for an additional price for his work on account of the war, the result being that the work has been postponed until the conclusion of hostilities. A scheme for the erection of a bridge over the railway in the centre of the town, at a cost of £120,000, in addition to the purchase of land, had received the approval of the town council, and application was to have been made to Parliament during the present Session, but, owing to the war, this has been postponed until next November. The Great Central Railway obtained Parliamentary powers in 1912 for the construction of a large extension to their fish dock at Grimsby, and they obtained tenders for this work in July last. This also has been postponed until the conclusion of the war.

Grimsby (Mr. ALBERT HOBSON, M.I.M. AND CO.E., engineer and surveyor to the rural district council).—Several streets are to be completed, at a cost of £1,850. A loan for £2,212 has been obtained in respect of surface-water sewerage for the parish of Immingham, and it is proposed to commence this work early in the year. A scheme of sewerage for this parish, estimated to cost £18,500, is now before the Local Government Board. Sanction to a loan of £4,990 has been obtained for the widening and improvement of King's-road, including the construction of a new bridge, and it is proposed to commence this work, part departmentally and part by contract, at once. Other projects include a large scheme of town planning, consideration of a housing scheme, granite setts, and tar-spraying of considerable lengths of the highways, and the extension of sewers in various parishes.

Guildford (Mr. E. YOUNG HARRISON, ASSOC.M.INST.C.E., A.M.I.M.E., borough surveyor and water engineer).—The council have already decided to carry out the widening of the London-road, Chertsey-street, and Farnham-road improvement. A 15½-in. borehole has been sunk into the chalk, [illegible] capable of yielding a further supply of [illegible] for the town of 50,000 gallons per hour. A [illegible] pumping plant, delivering 10,000 gallons per hour into the reservoir, and a [illegible] pumping station is to be provided. Further reservoir accommodation, and a proposed [illegible] the whole of the town's water supply, are under consideration. The contract for the erection of twenty houses for the working classes is nearing completion, and it is proposed to provide further accommodation to meet the urgent need for this class of property. Allen House Grounds, and the Foxenden Quarry in the centre of the town, having an area of 10 acres, have been presented to the town for the use of the public as pleasure grounds. A scheme for laying out the site is to be prepared during the year. Alterations and additions to the corporation sewage works are in course of preparation to meet the requirements of the Thames Conservancy. Several private street works are in hand and under contemplation, also the extension of the wood paving in High-street. The council have before them recommendations to provide means for preparing their own tar-macadam, and for reorganising the [illegible] administrative departments.

Halifax (Mr. JAMES LORD, ASSOC.M.INST.C.E., borough engineer and surveyor).—A Bill is being promoted in Parliament for tramway extensions in Brighouse and Rastrick to the Huddersfield boundary, Elland, Ripponden and Stainland, and trackless trolley cars to Siddal and Wainstalls, together with doublings on various parts of the system, at an estimated cost of £164,000. In connection with the sewage disposal works a new sludge main from the humus tanks at Copley to the press works at Salterhebble is about to be laid, and a scheme for storm-water treatment is being considered. Schemes for a refuse destructor and new public abattoirs are under consideration. New cast-iron main outfall sewers in the Hebble and Ovenden brooks are in progress of construction, together with a new main sewer in Keighley-road. The extensive widening of Huddersfield-road, co-extensive with the sewage works, will be completed during the ensuing year.

Harrogate (Mr. C. E. RIVERS, ASSOC. M.INST.C.E., borough engineer and surveyor).—Several schemes which were contemplated last year are standing in abeyance in consequence of the war, and the works for the ensuing year have not yet been decided upon. Private street improvement works will be proceeded with. Twelve streets are now in hand, and plans are being prepared for another ten streets. New surface-water drainage schemes are in progress in several districts in the borough, and will be completed in the spring. The erection of a new elementary school for 450 children is in hand, and will be completed in the early summer.

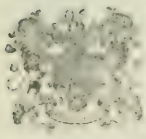
Hartlepool (Mr. A. P. HORSLEY, borough engineer and surveyor).—Under the Housing of the Working Classes Act the council have approved of a scheme for clearing an insanitary area, comprising 111 properties, laying out new streets, and the erection of thirty-four workmen's dwellings, at an estimated cost of £15,000. The scheme is now before the Local Government Board. As an improvement scheme, the council have with funds at their disposal acquired four blocks of insanitary property adjoining this area, and intend to demolish the same and erect on the site sixteen better-class houses, involving an expenditure of £8,500. The work to be put in hand at once. Plans for a new elementary school for 864 scholars are now before the Board of Education, and the other prospective works include a shelter on the cliffs, re-formation and sewering of Central-road, private street improvement work, and [illegible] on the Town Moor.

Harwich (Mr. F. HAROLD FRENCH, borough surveyor).—The works projected for 1915 include the reconstruction of low-level sewers, estimated cost, £5,000; construction of new road for military authority, and repairs to existing tracks, estimated cost £700; widening of dangerous corners in several parts of borough; the building of ten workmen's dwellings, approved by Local Government Board; construction of new public convenience; and the making up of several private streets under the Private Street Works Act.

Herefordshire (Mr. G. H. JACK, F.G.S., M.S.A., county surveyor).—The principal works to be undertaken during 1915 are as follows: Main Roads and Bridge Department—5 miles of new road foundations and drainage, 9 miles of new bituminous surfaces, 10 miles of tar-painting on reconstructed roads, and repairs to many ancient bridges; Architectural Department—two new elementary schools, one new police court, additions to county college, and extensive repairs to many council schools and police stations. There are in Herefordshire 502 miles of main roads, 400 bridges and culverts, 178 schools, council and voluntary, and 10 police stations and court-houses.

Haslingden (Mr. J. SINGLETON GREEN, borough engineer and surveyor).—Among the works to be carried out this year will be the completion of the new central council schools to accommodate 1,200 scholars. Important road widening schemes at Helmshore and Rising Bridge will be commenced, at an estimated cost of £2,000. Towards these grants have been promised by the Road Board and county council.

ground. The borough surveyor has prepared a



Hereford (Mr. [illegible]) estimated at £8,000. Sixty-two cottages are in hand, and will be completed during the existing financial year, at an estimated cost of £11,800. An extension of the sewage [illegible] at an estimated cost of £950 has been sanctioned, and will be commenced in March next. The [illegible] will be completed during the summer. Assistants and forty-seven men from the surveyor's department having joined Kitchener's Army or the Territorials, renders postponement necessary of the following: Alterations to [illegible] the conclusion of the war.

Hertfordshire (Mr. J. S. Killick, Assoc.M.Inst.C.E., county surveyor).—The principal works in hand or contemplated during 1915 are: Reconstruction of High Bridge, Radlett, £500; [illegible] Bridge, £700; London-road, Bushey, between the Middlesex County Council and Watford Urban District, £20,575; new petty sessions court, Barnet, £4,799; ditto, Stevenage, £6,138; police station, Letchworth, £3,669; education offices, Hertford, £3,804; resurfacing various trunk roads, some with asphalt and others with tar-macadam, £140,419; depot at Hatfield [illegible] Letchworth, £1,100; new sanatorium at Willian, near Letchworth, £27,662; Barnet, Byng-road mixed and [illegible] £3,260; Hoddesdon [illegible] Park mixed school, £1,390; Bishop's Stortford Northgate school, £3,611; and Elstree, Berkhamsted school enlargement, £2,600. The figures given are the estimated cost in each instance.

Heywood (Mr. James B. Nuttall, borough surveyor).—The work intended to be carried out during the coming year will be as follows: Private street works; granite paving main roads; intercepting sewers; laying out of Heywood recreation ground, and provision of bowling green, proposed extensions of Queen's Park and new boating lake; extensions of electricity works; new electricity sub-station, Heap Bridge; and alterations and extensions of the sewage works.

Heston and Isleworth (Mr. J. G. Carey, Assoc.M.Inst.C.E., surveyor to the urban district council).—The programme of works proposed to be undertaken during 1915 is an extensive one. Included among them are the resurfacing of Bath and Staines roads with asphalt-macadam, and other contingent works, at an estimated cost of £40,326, and the resurfacing of Heston-road with bituminous-grouted macadam, and the construction of an 18-in. surface-water sewer and other contingent works, at an estimated cost of £8,879. The reconstruction of the tram track and paving of the margins of the carriageway with wood, and granite sett and Lithofalt paving in High-street and London-road, for a distance of 2½ miles, will be completed in the spring. The new Alexandra schools for the accommodation of 840 children are at present in hand, and will also be completed in the spring, at a cost of £13,000. The new Great West Road, which for the greater part of its length runs through the heart of this district, will probably be under construction by the Middlesex County Council. In addition to the above, the work involved with the extensive town [illegible] additions to the surface-water sewerage system are

Highworth [illegible] to the rural district council).—The projected works include the reconstruction of about 1¼ miles of dis[illegible] metalled road. The roadway is to be made up 20 ft. wide, with 12-in. foundation, and the surface finished with Mendip limestone. The estimated cost is £2,500. Wroughton: Extension of water supply; 250,000-gallon reservoir, with pumping plant, estimated to cost £1,336.

High Wycombe (Mr. F. J. Rushbrooke, M.I.M. and Co.E., borough [illegible] It is understood that the reconstruction and extension of the sewage outfall works, and sewering of W[illegible] Marsh (£8,400), a road extension, and ferro-concrete bridge, extension of surface-water drainage, and the conversion of a further length of water-bound to tar-macadam road, will be the chief special works put in hand during the coming year. The new grammar school and an elementary school will be completed.

Hinckley (Mr. F. H. Clemi, Assoc.M.Inst.C.E., surveyor and waterworks engineer to the urban district council).—It is proposed to lay down a new pumping main at the sewage outfall works, and to proceed further with the experimental filter-beds. The water scheme for the parish of Burbage will be in course of construction, and the council intend to reconsider the question of a refuse destructor, and the erection [illegible] dwellings.

Holland, Lincs, South Division (Mr. A. W. Lloyd, M.I.M. and Co.E., county surveyor).—It is not proposed to undertake any works of magnitude during the year. In addition to ordinary routine work, the lengths of roads to be tar-sprayed are to be increased from 18 miles to 28 miles. The council have had a scheme for the remetalling and steam rolling of a considerable length of main roads under their consideration, but this has been postponed for the present.

Honiton (Mr. A. Tillotson, M.I.Mun.E., C.R.San.I., borough surveyor, sanitary inspector and waterworks manager).—The works contemplated for 1915 include the construction of new sewage disposal works and sewerage alterations, for which the Local Government Board [illegible] sanctioned a loan for £4,700. The whole of the granite-surfaced roads will be tar-painted by direct labour.

Horsham (Mr. R. Renwick, surveyor and water engineer to the urban district council).—No new works of any importance are in contemplation for the coming year in connection with the surveyor's department.

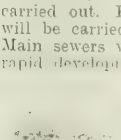
Hove (Mr. H. H. Scott, Assoc.M.Inst.C.E., borough surveyor).—The town council have decided to erect machinery to crush the whole of the house refuse from the borough, at a cost of £5,000.

Hucknall Torkard (Mr. W. Swann, surveyor and waterworks engineer to the urban district council).—Among the works projected by the council for the year are the erection of a fire brigade station, stables and cart-sheds. The laying out of 11 acres of land for a public park, making provision for bowling greens, cricket pitches, together with bandstands and other buildings, are also contemplated.

Huddersfield (Mr. K. F. CAMPBELL, M.INST.C.E., borough engineer and surveyor).—Good progress is being made with the housing scheme authorised by the town council, for which the Local Government Board have sanctioned a loan of £103,555. This provides for the erection of 500 working-class dwellings, referred to in last year's list of projected works. Contracts have already been let for 133 houses, which are now in course of erection. The cost per house of five rooms is, approximately, £200 inclusive. The corporation have obtained the approval of the Local Government Board for a town planning scheme applicable to three special areas within the borough, and are engaged upon the preparation of a scheme to deal with the remainder. In addition to the usual work connected with the maintenance of highways and sewerage systems, a continuation will be made with the paving in granite and wood of certain sections of main roads, which work forms part of a scheme for street widenings, involving a total expenditure of £72,000, towards which a grant is being made by the Road Board. A commencement will be made with the construction of important relief sewers in certain districts that have rapidly developed in recent years. A scheme for the disposal of sludge is being installed under special conditions, and the work will be in operation on an early date. Plans have been approved by the council for the erection of new swimming baths at the junction of Cambridge-road with Claremont-street, and tenders will shortly be invited. It is also proposed to extend the existing baths. The Education Committee propose to erect an open-air school for defective children, and to extend the present buildings of the municipal high school for girls. An important scheme for the extension of the municipal college is being considered, and, it is expected, will be approved on an early date. Extensions of the tramway system in various ex-municipal districts, for which Parliamentary powers have been obtained, have been completed. The doubling of the main lines within the borough is in course of construction. It is intended to apply to Parliament next Session for additional powers to extend the tramway to other districts contiguous with the county borough. An important scheme for the erection of a tuberculosis hospital has been approved by the Local Government Board, and it is intended to invite tenders on an early date.

Hull (Mr. F. W. BRICKNELL, ASSOC.M.INST.C.E., acting city engineer).—No street works or street widenings are likely to be carried out. Certain very important works have been under the consideration of various committees, but it is not intended to press them forward during the war. The tramway extension on Cottingham-road is nearly completed, and will probably be opened early in the New Year. Further extensions have had to be deferred in consequence of the shortage of wood paving blocks. Powers are being sought for a loop through Chariot-street and Waterworks-street, and extensive repair shops are in construction at the Liverpool-street depot. A tuberculosis hospital is under construction at Cottingham Castle, and it is contemplated to erect an isolation hospital on adjoining land. The site for a boating lake adjoining Pickering Park has been presented to the town by Mr. Christopher Pickering, and a grant-in-aid has been made by the Local Government Board. It is intended to proceed with the construction of the lake as soon as the exigencies of unemployment demand it. New waterworks are in hand on the Dunswell site. The Education Committee have a higher grade girls' school in hand, and contemplate the erection of an open-air school, in addition to their usual programme of extensions.

Ilford (Mr. H. SHAW, M.INST.C.E., engineer and surveyor to the urban district council).—This council early in the new year will complete the erection of a phthisis pavilion, which has been erected at a cost of over £1,100. Extensions to the administration block at the isolation hospital are proposed, at an estimated cost of about £4,000. The refuse destructor buildings will be erected, and a plant by Heenan & Froude installed, costing about £22,000. Quantities are being prepared for new baths to be erected at an estimated cost of £25,000, and it is anticipated the erection of these buildings will be proceeded with during 1916. Plans are being prepared for the erection of a central library, which work, it is anticipated, will be pushed on with. Application has been made to the Local Government Board, and, subject to their sanction to the loan, a new park, 30 acres in extent, will be laid out at Aldborough Hatch, at an estimated cost of nearly £11,000. The laying out of the extensions to Goodmayes Park will shortly be completed, which will add to the parks area in this district another 30 acres. A contract amounting to about £34,000 will be proceeded with for granite-sett paving two main roads in the district. The usual large amount of private street works will undoubtedly be proceeded with, amounting to about £8,000, and a considerable number of road improvements will also be carried out. Extensions amounting to over £4,000 will be carried out at the sewage disposal works. Main sewers will be constructed, as the continued rapid development of the district requires.



Ilkeston (Mr. HENRY J. KILFORD, borough surveyor). Sewerage: The completion of the (£30,000) sewerage scheme, and four small electric pumping stations. Public Street Improvements: High-street widening, including the demolition of a lot of old property, and continuation of a new road from High-street to Cantelupe-road, about 300 yds.; new bridge over the Nutbrook Canal, on the main road to Derby; private improvement works estimated to cost £2,000. Recreation Grounds: New bowling green, pavilion and bandstand, Victoria Park; enlargement and reconstruction of cricket ground for county matches, new pavilions, and fencing, and entrance gates to the Rutland recreation ground. Water Department: Duplication and laying in of larger mains; erection of a reinforced-concrete water tower. General: New post office by the Government in South-street, adjoining the free library; new fire station; motor fire engine and equipment; public baths; new by-laws.

Inverness (Mr. T. H. SCOTT, ASSOC.M.INST.C.E., burgh engineer and surveyor).—The work contemplated by this department for the ensuing year embraces a new joint infectious diseases hospital and sanatorium to cost about £15,000. Plans, specifications and schedules pertaining to this scheme have been approved by the Local Government Board, and tenders have been received. The hospital is for the joint use of the burgh, and the first and second districts of the county of Inverness. Plans are in course of preparation for public baths, and this scheme will probably materialise during the coming year. Granite-sett paving will be considerably extended within the burgh, and private improvement works will be continued, as a number of streets still require to be formed. A new district sewerage scheme is just about completed, and probably another similar improvement will be carried out in another district of the town. Among the smaller matters which may engage the attention of the department are additions to the public slaughter-house, new workshops for the department, additional public lavatory accommodation, and tarpaving of macadamised roads.

Ipswich (Mr. JOHN R. MEAD, borough engineer and surveyor).—In addition to the work usually carried out by administration and charged to revenue account the following works will be proceeded with: Public Health Offices (£7,300).—This block of buildings provides ample accommodation on the ground floor for the sanitary inspectors, tuberculosis dispensary, including X-ray room, and for the infants' department. On the first floor provision is made for the medical officer and his assistants, private offices, laboratories, and the school clinic, which includes an anæsthetic, operating and recovery room, together with a dental department. Small-pox Hospital (£4,800).—These buildings are in hand, and comprise administrative block, pavilions, laundry and mortuary on a 10-acre site, about 2 miles beyond the borough boundary. Isolation Hospital.—Extensive additions are now being made at this hospital, costing about £9,000, which includes a twenty-four-bed cubicle block, and contracts have recently been let for heating the institution at a cost of £4,200. In addition to the above tenders have also been invited for two

twenty-foot pavements which will cost about £3,700. Contracts for the following will probably be let during the year: A new ferro-concrete bridge over the River Orwell, to replace the existing Stoke Bridge, including kerb, and additions to concrete bridge at Ipswich Docks; and extensions to sewers required by Chemical Works, now being erected, rearranging the existing sewage works.

Itchen (Mr. T. A. Collingwood, engineer and surveyor to the urban district council).—The works which will be carried out during the year consist of street improvement; private street [illegible] the existing sewage and sewage disposal works.

Kendal (Mr. F. W. Oxberry, borough engineer and surveyor).—A [illegible] has been widened at a cost of £3,400, and two or three smaller widenings have been effected. A housing scheme for the erection of twenty-four workmen's dwellings is in hand, contracts having been let and the work commenced. Extensions to the sewage disposal works (£10,000) are also in progress. [illegible] gravel footpaths are being substituted by concrete flags. During the year it is proposed to extend the sewers at a cost of about £1,000, and the conversion of water-bound macadam roads into tar-macadam will be continued. It is proposed to extend the borough boundaries by including a part of Scalt'waiterigg, the memorial and plans relating thereto having been presented to the Local Government Board.

Kent (Mr. H. T. Chapman, county surveyor).—During the year 1915-16 it is probable that the strengthening and carpeting of the most important main roads will be very extensively proceeded with. Prior to the war, Kent obtained a very large quantity of granite from Belgium, and this source of supply will probably be unavailable for some time. War risks, and consequent higher freights, have caused a great increase in the cost of supplies by water, and railway rates cause other important materials to be very costly. The council will therefore be compelled to depend to a greater extent on the local materials, and it is the intention of the county surveyor to utilise these to the utmost. By the use of proper plant (for which purpose the Road Board have granted a loan free of interest), local materials—*e.g.*, flint, shingle, and sand—if properly broken, graded, heated, and mixed with pitch or bitumen, as good, if not better, results can be obtained than with the more costly granites and basalts. It is also proposed to use a larger quantity of Kent rag tarred macadam and slag tarred macadam than in previous years. Considerable damage has been and is being caused to the main roads by heavy military traffic, and the reinstatement of this will entail extensive repairs. Relief labour schemes, estimated to cost over £200,000, have been prepared in case of distress owing to the war. Although these include many more or less desirable improvements, it is to be hoped that circumstances will not arise necessitating their being put in hand for the purpose of providing labour for unemployed. Many other Road Board improvement schemes have been prepared. These include diversions, widening and strengthening of carriageways, improving dangerous turns, surface-water drainage, and the kerbing and forming of footpaths. The council have under consideration the improvement of about 6 miles of the London to Folkestone main road from Hewingreen viâ Frogholt to Cheriton; a new road connecting Dartford and Erith; the continuation of the widening of the Blackfen to Bexley road; and many other extensive schemes; also the rebuilding and widening of Dartford Town Bridge. Practically the whole of 750 miles of rural and urban main roads will, no doubt, as in previous years, be tar-painted. This will require over 1,000,000 gallons of tar.

Kesteven (Mr. W. B. Purser, Assoc.M.Inst.C.E., county surveyor).—Plans are now being prepared for a new school in Starford for 600 scholars, and in Wykeham for 120. Roads are now constructed with improved binders, and some 40 or 50 miles are surface-sprayed every year. Near Grantham several main roads have to be strengthened and receive extra attention owing to the heavy military traffic in this neighbourhood. Extensive schemes have also been prepared for the prevention of floods, but these will only be carried out in case of national distress in order to find work for the unemployed.

Kettering (Mr. Thos. Reader Smith, Assoc.M.Inst.C.E., surveyor to the urban district council).—The public baths, which have been in hand during 1914, are now approaching completion. The open-air bath was sufficiently advanced to be opened last June, and the covered bath, with slipper and vapour baths, is approaching completion. Other work may include some extension of wood block paving in the centre of the town, a scheme for improvement of footways, and [illegible]

Kidderminster (Mr. A. James, borough surveyor).—The projected works for 1915 are sewage disposal works and the drainage of the districts recently added to the borough, together with new engines, rising main and settling and storm water [illegible] of an estimated cost of £31,000. The reconstruction of roads under Road Board grants, and the construction of streets under the Private Street Works Act, 1892, together with the tar-painting of about 12 miles of roads, will also be proceeded with.

Kidderminster (Mr. G. J. Shepherd, surveyor to the rural district council).—Additional to the general routine work in this district, more road widening and improvements will be carried out, and important road diversions are projected. Considerable sections of roads will be tar-sprayed, and materials other than ordinary macadam will be adopted to cope with the increased motor and mechanical traffic. Schemes have been approved by the Local Government Board for supplying the parishes of Wribbenhall and Churchill with a water supply, and these will be carried out forthwith.

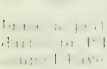
King's Lynn (Mr. Alfred J. Smith, borough surveyor and water engineer).—The works for the ensuing year have not at present been definitely settled, but it is probable that they will include additional lengths of roads within the borough, to be reconstructed upon the same principle as adopted last year—viz., by laying a solid foundation of slag, and facing up with 3 in. of granite, grouted in with Tarvia. Several private streets will be made up, and an additional stand-by pumping plant erected at the waterworks.

Kingston-upon-Thames (Mr. R. Hampton Clucas, borough surveyor).—The council's works for the ensuing year will include a new secondary school to be erected on land next to Denmark-road. The main Hoggs Mill River passes through the site, and before the ground can be used for school building purposes it will be necessary to divert the course of the river by constructing retaining walls and forming a new river basin 20 ft. wide for a distance of about 380 lin. yds. This work will be executed at an early date. New wood-paving works and important street improvements are also contemplated, and several streets will be commenced under the Private Street Works Act. The work of converting the roads from ordinary water-bound macadam to tar-macadam, Plascom grouted or carpeting, will be continued. Plans have been prepared for an additional swimming bath.

Kirkcaldy (Mr. J. L. Lumsden, burgh surveyor).—The principal work next year will be the erection of an additional sanatorium for twenty-four beds and additions to administrative block and a dispensary. All these new buildings are close to the fever hospital in Dunnikier-road. The total estimated cost of the buildings is £5,050. The proposed esplanade is again being revived, but it is

difficult to say whether the proposals will mature. The cost is estimated at about £22,000. A fair amount of tar-spraying is intended to be done. The work in connection with the new outfall sewer at Charlotte-street, and the built sewer along Sands-road, is making good progress, and it will probably be completed by March. The contract for this work is £5,258.

Kiveton Park (Mr. Frank Hewitt, F.S.I., engineer and surveyor to the rural district council).—Highways: The widening of Outgang-lane, Starchhouses-road and Laughton-road being nearly completed, the improvement of a large number of other roads will be dealt with. Surveys and drawings are in hand, with the object of a loan being raised for the first twelve of these. Experimental lengths of Roncace and Vianex roads are being tried. During the summer further roads will be metalled with tar-macadam, and a large amount of tar-spraying will be carried out by contract and direct labour. Additional tar boilers and spraying machines have been purchased for the work. Private Streets: Plans for three streets are at present in the hands of the Local Government Board. Surveys and drawings are in preparation for four more, and these will be followed by a large number of others. Bridges: Drawings are in hand for the reconstruction of Hard-lane Bridge. Two new road bridges are proposed by the promoters of the new Worksop and Bawtry railway scheme. Sewerage and Sewage Disposal: The Local Government Board's sanction is awaited to the surveyor's scheme for enlarging Dinnington outfall works (£5,000). The plans for extending the disposal works at Kiveton Park are being amended in accordance with the Local Government Board's suggestions. The estimated cost is £3,000. Surveys are proceeding with a view to dealing with the Anston outfall, and the re-sewerage of South Anston will shortly engage the attention of the council. Levels are being taken for a sewerage and sewage disposal scheme for the village of Waleswood, and other purification works are also in contemplation. Drawings are in hand for a number of surface-water sewers, and extensions to existing sewers. Water Supply: Additional mains and other works will probably be carried out during the year. Scavenging and Refuse Disposal: The question of inaugurating a system of scavenging Dinnington by direct labour to supersede the present contract system is now being considered. It involves the purchase of horses and carts and the erection of stables and cart sheds. The wholesale conversion by the council of the privies into water-closets will also be considered. Improvements and renewals at the refuse destructor will be carried out during the year, and probably extensive alterations to the sewage pumping station and plant. Public Buildings: The new conveniences at Dinnington are nearing completion, and the surveyor's plans for a public mortuary in the same parish are under consideration. The question of the purchase of an additional steam roller and the erection of roller-house, cart shed and other depot buildings will be dealt with during 1915. Artisans' Dwellings: A couple of housing schemes are at present occupying the attention of the council.



Leeds (Mr. W. T. Lancashire, M.Inst.C.E., city engineer).—The present proposal for extending the sewering of the city, including the provision of a pumping station at Shadwell, to enable a portion of the extension of the city boundaries to be [illegible] completed. The city council have now authorised the preparation of town planning schemes for dealing with an area of about 4,025 acres. A new street, 60 ft. wide, adjacent to the proposed extension of the Leeds General Infirmary, in commemoration of the reign of King Edward VII., has been completed. The reconstruction of an area of about 60 acres in the centre of the city, acquired under the Housing of the Working Classes Act, 1890, is still proceeding. The city council have authorised an application to be made for the borrowing of money under the Housing (No. 2) Act, 1914, for the erection of forty-eight cottages. The city council, in conjunction with the trustees of Wade's Charity, are providing for a new open space of some 2½ acres near the centre of the city. The erection of a municipal hospital and administration block on the Killingbeck estate will be completed early in the year, also the erection of a tuberculosis pavilion and other additions to the Tuberculosis Hospital. Several street improvement works, Parliamentary and others, are being carried out. Under Mr. G. A. Hart, M.Inst.C.E., further progress has been made with the disposal works, and the work for constructing the high-level intercepting sewer is in hand. Under different departments an extension of the dead-meat market is being proceeded with, and new tramway offices are being erected.

Leek (Mr. W. E. Beacham, surveyor and waterworks engineer to the urban district council).—Several important works will be put in hand during the current year. During the past year the main roads leading to Ashbourne and Buxton have been improved by widening, and this year footpaths are to be put down over the land so added. The construction of several new streets near the station is contemplated, which will open up the west end of the town, and provide better means of communication. The Local Government Board inquiry has been held, and sanction to borrow the sum of £3,000 is expected. The laying out of the Brough Park (11 acres in extent) is contemplated, at a cost of £3,660. Extensions to the sewage disposal works in the south district are to be proceeded with, including settling tanks and additional artificial filters. Works of improvement in connection with the sewage disposal of the north district are also to be carried out, and with the ordinary work of street widenings and private street improvements, the year promises to be up to the average in municipal progress.

Leicester (Mr. E. George Mawbey, M.Inst.C.E., borough engineer and surveyor).—An extensive scheme for additional works in connection with town water-sewage disposal is now under consideration. New foul-water sewers will be laid in Evington-road, Leadenhall-street, and Spittlehouse-street, and another section of tributary sewers constructed. Clean trade-water and storm-water sewers in Asylum-street and Deacon-street will be completed, and a defective storm-water culvert in Woodgate will be replaced by one of more modern type. Extensions to the tramway system will be carried out. Work is at the present time in progress on two routes, which will be completed during the present year, and it is expected that a start will be made on one or two more routes. Large car-repairing shops and the extensive additions to the Lero generating station will be completed. A new house for the superintendent of the tramways main car depot will be erected. Extensive and numerous road improvements will be completed, including the reconstruction and widening of the Bow Bridge, and an important widening of Belgrave-gate. A new sanatorium and hospital block will be completed in the spring. New public conveniences for both sexes are to be erected in the Newarke.

Leiston-cum-Sizewell (Mr. Robert E. Wilson, M.I.M. and C.E., A.R.San.I., water engineer, surveyor and inspector to the urban district council.)—During the past year the new water supply scheme has been completed, also improvements at the sewage works. Sanction has been obtained from the Local Government Board for the erection of fifty workmen's dwellings on the Grimsey estate. The fencing and laying out of new cemetery will be carried out during the ensuing year, together with various street improvements, and the tar-painting of main streets. The question of purchasing horses and carts for the removal of house refuse by the council is being considered.

Leitrim Co. (Mr. E. O'N. Clarke, county surveyor). Improvement of roads approved of by the Road Board already in hand in the neighbourhood of Carrick-on-Shannon and Manorhamilton will be proceeded with. New road and bridge approaches at Hartley, Carrick-on-Shannon, will be completed. Upwards of 7 miles of new roads are at present under construction, and 9 miles more have been approved of. These are, generally speaking, in mountain districts, and cost about £280 per mile.

Lichfield (Mr. Percy V. Benn, A.M.I.C.E., city engineer and surveyor).—The work intended to be taken in hand by the city council during the coming year includes the erection of twenty workmen's dwellings, together with road making and drainage in connection therewith, the plans for which have been pre-

pared. Various road surface improvements are in contemplation, as also the widening of a portion of Lamworth-road, and the easing of a dangerous corner on the London-road. The rebuilding of a sanitary convenience will also be considered, as also the question of municipal offices.

Lincoln (Mr. R. A. M[illegible], M.INST.C.E., engineer, surveyor, [illegible] surveyor).—[illegible] on the river are contemplated, as well as the construction of another one at the east end of the city. Arrangements will probably be completed with the Road Board for the tar-macadamisation of the roads entering the city; four are done, and three remain to be done. The council are proposing [illegible] an outer one—at the north end of the city, and they hope to make a commencement during the year. In connection with these roads a town planning scheme is contemplated, and sanction has been obtained from the Local Government Board to prepare a scheme. Embraced in this town planning scheme is an area of 67 acres, which the corporation have purchased, for the construction of 800 or 900 workmen's houses. It is hoped to commence this scheme unless the war prevents it. The corporation are promoting a Parliamentary Bill for, among other things, freeing the commons from the Freemen's grazing rights, to run motor omnibuses or trolley vehicles, and additions to the electricity station, and also to obtain powers respecting streets, buildings and sanitation.

Liverpool (Mr. John A. [illegible], M.INST.C.E., city engineer).—The more important works in progress in the city engineer's department include the widening of a main approach to the city to 120 ft., 2 miles in length, with fenced-in tramways laid in grass; the completion of construction of portions of new wide road, Queen's-drive, and subway under railway; the construction of a northern outfall sewer, 2 miles in length, 9 ft. and 8 ft. in diameter, at considerable depth; the construction of southern relief sewer, 6 ft. by 4 ft. 6 in. in diameter; the construction of wider bridge over [illegible] and North-Western [illegible] in connection with subway, Queen's-drive, Mossley Hill; the reconstruction of large area of street pavements, consisting principally of substitution of pitch-macadam for boulders; and the construction of underground conveniences. The works in progress or proposed to be carried out during the year in the water engineer's department include the construction of filter-beds at Llanforda, near Oswestry, Salop, and the construction of clear water tank at Chorley, Lancs.

Liversedge (Mr. A. Rothera, M.I.M. and C.E., engineer and surveyor to the urban district council).—During the year the most important event likely to be accomplished will be the union of the three urban districts of Liversedge, Cleckheaton and Gomersal in one large urban district to be called Spenborough. The Order has been made by the county council of the West Riding of Yorkshire, and now only needs the confirmation of the Local Government Board to make it operative. The new urban district will be the largest in Yorkshire, so far as population is concerned. The sewage works, it is thought, will be completed, which will put Liversedge in possession of some up-to-date works, and, incidentally, the proposed new district, so far as the greater portion of the Cleckheaton and Gomersal sewage is concerned, is now treated by Liversedge. It is proposed to lay out the market site as a park and recreation ground, and also to put in order various adjacent private streets, plans of which are now before the board, the total estimate amounting to £2,777. Various schemes for the improvement of corners adjoining important main roads are now before the Road Board for their consideration, the cost of which is estimated at £137, while a plan for the widening of part of Bradford-road, a very important thoroughfare, to a width of 50 ft., at an estimated cost of £5,383, is now being considered by the same authority, and if carried out will constitute one of the best improvements effected in the district. No doubt, when the new district is formed and details settled, important public developments will take place in Spenborough, which is the centre of a very busy manufacturing area.

Llandudno (Mr. E. P. Stephenson, engineer and surveyor, Mr. W. T. Ward, deputy engineer and surveyor to the urban district council).—The principal works will be the construction of the new golf links designed by Mr. R. J. Colt, of Sunningdale; Queen's-road widening and improvement, completion of the new sewers, replacing old sewers, in the Craig-y-don district; the erection of sixteen new workmen's dwellings; further extensions of the improvements in the Happy Valley Pleasure Grounds; additions to the gasworks plants and buildings, and an additional trunk main; extension of the sewers to the gas and electricity works; extension of the water distributing mains; and the new through road from Llandudno to Colwyn Bay.

London, Camberwell (Mr. William Oxtoby, M.INST.C.E., borough engineer).—Owing to the unsettled condition of things through the war, no special works are contemplated during the present year.

London, Deptford (Mr. J. Sutcliffe, Assoc.M.INST.C.E., borough surveyor). — The council have decided to make up unpaved portions of the following streets—viz., Arica-road, Avignon-road, Finland-road, Revelon-road, St. Norbert-road, White Post-lane (Old Kent-road), and the whole of Troutbeck-road. Baths and wash-houses and library are to be erected in Evelyn-street, and slipper baths in Ilderton-road. Several macadam roads are to be converted to various types of permanent paving. In resurfacing certain [illegible] and all water-bound macadam roads are to be tar-sprayed after the next recoating. Additions are to be built to the superintendent's lodge at Brockley cemetery. A small public convenience is to be constructed at Brockley, and new stores and convenience at St. Paul's Churchyard. Alterations and additions are to be made at the council's depot, Knott-street.

London, Finsbury (Mr. P. G. Killick, borough surveyor).—It is not anticipated that any very extensive works will be carried out during the year, with the exception of repairing several streets with creosoted deal paving, and probably a few macadam streets with bituminous material, and the reconstruction of two or three sewers. The leases having fallen in on a large portion of the Marquis of Northampton's estate, considerable improvements are likely to be carried out before rebuilding. The Metropolitan Water Board offices in Rosebery-avenue will be commenced during the year, and an improvement effected in connection therewith.

London, Holborn (Mr. E. F. Spurrell, borough surveyor).—The council will during the year carry out works of repaving roads and reconstructing sewers, but the list has not yet been decided upon. The only other work the council will undertake is the erection of workmen's dwellings on a site near to Seven Dials.

London, St. Pancras (Mr. Wm. Nisbet Blair, M.INST.C.E., borough engineer and surveyor).—The estimates already approved extend up to March 31st, and nothing can yet be said as to what may be done during the rest of the year.

London, Woolwich (Mr. J. Rush Dixon, M.INST.C.E., borough engineer and surveyor).—Extensive road widenings and improvements will be proceeded with in connection with the construction, by the London County Council, of an overhead electric tramway to link up and do away with the existing terminus at Lee Green and High-street, Eltham. The resurfacing of motor-'bus routes will be continued. A sewerage scheme, with a view to flood pre-

Woolwich, in Woolwich and Plumstead, estimated to cost £9,000, has been approved, and will be carried out by direct labour. Owing to war requirements, the Government has requisitioned a number of horses, and the council's staff has been greatly depleted thereby, with the result that further mechanical traction for scavenging and the haulage of road materials will have to be considered. There has been a large influx of workers to Woolwich Arsenal, and this has resulted in a great scarcity of housing accommodation, which is now receiving the serious consideration of the council, with a view to further houses being erected. With a view also to relieving possible distress arising in the borough as a consequence of the war, road improvements and widening schemes have been prepared for Bexley-road, Eltham, and will be undertaken if necessary with the assistance of the Road Board, at an estimated cost of £13,000. The extension by the Port of London Authority of the Royal Albert Docks at North Woolwich is proceeding. In addition to the usual sewerage and private street works, there will, no doubt, be increased activity in the development of the several extensive building estates in the borough.

Louth (Mr. Thomas Walsh, county surveyor).—The principal works projected by the county council at present are: The improvement of Dublin—Belfast road (£10,900); the erection of county buildings at Dundalk (£6,000); erection of roads stores at Carlingford Harbour; and completion of pier and harbour at Hunterstown, with some other works on local roads.

Lowestoft (Mr. G. H. Hamby, Assoc.M.Inst.C.E., borough surveyor). The war has not materially altered the prospective programme of work of development in the borough. Schemes have been expedited which require a large proportional amount of labour, in view of possible eventual unemployment in the town. Works of sewerage, including rising mains and pumping stations, to cost about £11,000, have been sanctioned, and are ready to be commenced. A scheme for the improvement and resurfacing of roads in the borough, now submitted by the council with a view to them being declared main roads, and costing £10,000, is under negotiation, and will probably shortly be put in hand. Reinstatement of several timber groynes on the North and South beaches, rendered necessary by the existing timber having worn out, has been found necessary, and a comprehensive scheme, involving the spending of several thousand pounds, is in course of preparation. Application has been made to the Local Government Board for the borrowing of £2,000 for the making up of Iceworks-road, and the sheet piling of Waveney-drive Embankment, rendered necessary by the erection of a new factory and quays at this spot. These, together with the making up of some score of private streets, will probably be the limit of municipal activity in the borough during 1915.

Luton (Mr. J. W. Tomlinson, borough engineer and surveyor).—Extensions of the sewage disposal works will be completed, and new sewage pumping plant will be installed. The new refuse destructor will be proceeded with, and should be in operation by autumn. The new infectious diseases hospital will be commenced, and it is hoped to have part of the buildings in use before the end of the year. Two railway bridges, involving an expenditure of £15,000, will probably be built, a girls' secondary school will be provided, and an elementary school will also be erected.

Lytham (Mr. A. J. Price, surveyor to the urban district council).—A Local Government Board inquiry into the purchase of the existing council offices, baths, and public hall, with a view to rebuilding them on more modern lines, and the construction of a marine lake and bathing pool on the foreshore, was held recently, and it is hoped to be able to commence the construction of the marine lake and bathing pool some time this year. The plans for the marine lake and bathing pool, which have been approved by the council, provide for the enclosure of some 25 acres of the foreshore, and the cost of the lake and bathing pool is estimated at £16,500. The West End sewerage scheme should be completed in the summer, and several other smaller sewerage schemes will be carried out. A number of private streets are to be made up, and the use of tar-macadam on the principal roads is to be extended. It is hoped to widen from 20 ft. to 60 ft. a portion of the main approach road from Preston, within the Lytham area. A town planning scheme for the district is now being prepared. The electricity scheme, for which the Local Government Board have been asked to sanction a loan of £2,500, is at present held up owing to a dispute with St. Annes over the question of supplying current to the local tramway company, but it is hoped that matters will be amicably settled, and the work commenced shortly.

Macclesfield (Mr. S. C. Bayliss, M.I.M. and C.E., borough surveyor and waterworks engineer). In connection with the waterworks extension scheme, provision will be made for an additional water supply and impounding reservoir. Additions to the sewage disposal works, comprising percolating filters, humus tanks, and pumping machinery, will be made. The contract for additions to the borough isolation hospital, amounting to about £8,000, is expected to be let during the year. Further private street works, sewering, surface-water sewering, roads improvement, and the laying of granited rock asphalt roads, will be the chief work of the highway department. In addition, the Oxford-road Bridge will be completed.

Malvern (Mr. Wm. Osborne Thorp, surveyor and waterworks engineer to the urban district council).—The work of remaking some 2½ miles of roads in the district is now in hand, so as to relieve those portions of existing heavy traffic, which they are continually subjected. The roads are being excavated to a depth of from 15 in. to 18 in., packed with block stone, and coated with 6 in. of Clee Hill stone. Progress is also to be made with the main outfall sewerage scheme sanctioned by the Local Government Board, and several new lengths of 4-in. and 6-in. water mains will be laid during the year. Extensions at the electricity works are in hand.

Market Harborough (Mr. H. G. Coales, Assoc.M.Inst.C.E., F.S.I., engineer and surveyor to the urban district council). In view of the war, the council does not propose to carry out any new work that is not absolutely required, although the council had under consideration a town planning proposal, with certain street widenings.

Mansfield (Mr. Thos. P. Collinge, Assoc.M.Inst.C.E., borough engineer and surveyor). Further progress will be made with the scheme of road reconstruction in tar-macadam under the Road Board scheme. The work is to be carried out in two years, at a cost of £5,724. A number of roads will also require new foundations and reforming, owing to the heavy traffic to the military training camp at Clipstone. It is proposed to enlarge the sewage disposal works at Mansfield and Pleasley Hill, and construct new sewers at Pleasley Hill, at an estimated cost of £1,300. A length of sewer 3 ft. in diameter is to be constructed in Chesterfield-road, at an estimated cost of £1,500. A housing scheme has been approved by the council, and plans for the erection of forty workmen's dwellings have been forwarded to the Local Government Board. Progress is also being made with two town planning schemes which embrace the whole of the undeveloped land in the borough. Several streets are to be made up under the Private Street Works Act, and further road widening will be carried out under a Provisional Order. A tender has been accepted, amounting to £4,189, for additions to infectious hospital, and this work is now in hand. Part of the town hall premises will be altered and converted into more commodious offices for the borough surveyor's department. A

site has been purchased for the erection of a technical school, and new council schools are to be erected in Chesterfield-road.

Marlborough (Mr. G. PARKER PEARSON, ASSOC. M. INST. C. E., borough engineer and surveyor). In all probability an important road widening and improvement scheme will be carried out. The main roads will again be treated with a dust preventative material. Further lengths of defective and leaky stoneware-pipe main sewers will be taken up and relaid, and, in waterlogged ground, cast-iron pipes substituted. The extensions of waterworks, including new reservoir, engine-house of pumping station, new engines and pumps, now in hand, will be completed in the course of the year. Numerous repairs will be done to corporation property.

Marple (Mr. D. J. DIVER, engineer and surveyor to the urban district council).—In addition to the ordinary routine works, the following works will be carried out this year—viz., sewering Windlehurst-road; widening Windlehurst-road; new 6-in. water main from Moseley Brow to Market-street; sewering the Low Marple portion of the district; and making up Derby-street, St. John's-street and East-vale.

Matlock (Mr. JOSEPH TURNER, surveyor and waterworks engineer to the urban district council).—The council are negotiating for the purchase of a strip of land at the junction of two important highways for road-widening purposes. They have also decided to construct an additional water-storage reservoir to supply the district situate on the high levels. No other works of any moment are projected, except in the ordinary routine work of maintaining the main and other roads. The main sewerage scheme is being proceeded with.

Meath (Mr. JAMES QUIGLEY, county surveyor).—All roads, 1,603 miles, are now maintained by direct management, or direct labour, as it is styled by the Irish Local Government Board. During 1915 arrangements will be made for rolling all broken stone, so that, except on hilside roadways, no more raw metal will be spread. A grant of £3,679 has been obtained from the Road Board, and the county council have added an equal sum, £3,679, for improving the surface of certain main roads by metalling, rolling, and tar-painting. This work is already well advanced, and will, it is hoped, be completed by about September next. Last year the expenditure was for maintenance, £24,980; for improvement, £4,550.

Meriden (Mr. THOMAS HENRY NIGUS, M.I.M. AND C.E., district surveyor to the rural district council).—Although several sewerage and water schemes involving an expenditure of some £30,000 have been sanctioned by the council, and the plans of same are nearing completion, it is very doubtful if more than one-third will be proceeded with during the continuation of the war.

Middlesbrough (Mr. S. E. BURGESS, M.INST.C.E., L.R.I.B.A., borough engineer and surveyor).—The first portion of the Snowdon-road main drainage scheme (estimated cost £33,850) is well in hand, and no doubt will be completed during 1915. The total estimated cost of the entire scheme is £60,000. It is proposed to improve the main drainage system of North Ormesby recently included in the borough boundary of Middlesbrough), and a scheme is now being prepared. The following works have also been under consideration, and will in all probability be put in hand during the year—viz., Acklam-road and West-lane widening improvement; Marton-road widening; Parliament-road corner improvement; new isolation block to sanatorium, West-lane; laying out of recreation ground (Ayresome district, 7½ acres in extent), with the provision of swings, giant strides; extension of public swimming baths; bridge for vehicular and pedestrian traffic over North-Eastern Railway level crossing. Schemes have been adopted under the Housing and Town Planning Act, 1909, for dealing with the insanitary property in the borough, and further schemes are being prepared. Repairs to insanitary property (in cases where owners have failed to undertake repairs in accordance with notices served) are also to be carried out by the corporation, and the cost will be claimed from the responsible owners. Under powers granted to the corporation by the Bill passed in the last Session of Parliament, the toll-bar roads are now under the jurisdiction of the corporation, and consequently additional road paving works will be involved. Private street improvement works will proceed as usual (estimated cost £10,000), also the abolition of privy middens and pan closets, and conversion into water-closets (estimated cost £12,000).

Middleton (Mr. W. WELBURN, M.I.M. AND C.E., borough surveyor).—The following works are in hand, and under consideration—viz., main road widening, £6,000; new street, Gonclough, £4,000; new street off Boarshaw-lane, £4,800; new bridge over river, £1,030; new main sewers, £3,840; private street works, £1,800; workmen's dwellings, £5,000; new town hall (under consideration), and new baths (under consideration). The greater portion of the above will be carried out during the year.

Montgomery (Mr. G. A. HUTCHINS, M.INST.C.E., county surveyor).—New works proposed to be carried out in Montgomeryshire during 1915, in addition to ordinary main roads, bridges, and buildings, maintenance and improvements, are about 4 miles of tar-macadam road surfacing, 2 miles of tar-spraying, and eight dangerous corners improved. In the education department, new schools have been proposed for Hirnant, Rhosybrithdir and Esgairgeiliog. In addition, several existing schools will be improved.

Morecambe (Mr. J. W. HIPWOOD ASSOC.M.INST.C.E., borough engineer and surveyor).—Owing to the war, the proposed widening of Poulton Bridge, estimated to cost £15,000, has been postponed. The town is being utilised by the military authorities for the training of four Manchester battalions, 5,000 strong. Improvement schemes are therefore suspended until the termination of their training. A special Parliamentary Committee has been appointed with a view to promoting an omnibus Bill in Parliament, including tramway reconstruction work and promenade extensions. Minor improvements are being proceeded with.

Morpeth (Mr. J. DAVISON, borough surveyor).—During the ensuing year it is expected that a new scheme for the provision of workmen's houses will be proceeded with, the council having agreed to purchase 6 acres of land adjoining High Stanners, on the west side of the town. The widening of roads and cutting off dangerous corners will also be undertaken in the early part of the year. The occupation of the borough hall as a military hospital has prevented the carrying out of the seating and furnishing of the hall. The erection of a quay wall at the riverside, and making up the roadway at Bays Land has been postponed on account of the heavy expenditure during the war. Possibly private street works will be carried out in other parts of the town during the year.

Neath (Mr. D. M. JENKINS, ASSOC.M.INST.C.E., borough engineer).—The works carried out during the past year, and in course of completion, include a service reservoir; mains and fittings for auxiliary water supply; various works in connection with the existing water undertaking; road widenings; council school extensions; and workmen's dwellings. During the current year the contract for ninety-three houses is expected to be completed. Alterations to and extensions of the borough police station will be proceeded with, and a number of private street works will be carried out. Considerable extension of electrical distributing mains are contemplated, and among other works expected to materialise are

an open-air bath and further road widenings and street improvements. The corporation have also under consideration the resurfacing of main traffic roads with asphalt or other special material, to meet the requirements of the constantly increasing heavy motor traffic.

New Malden (Mr. Reginald H. Jeffes, assoc.m.inst.c.e., engineer and surveyor to the urban district council).—The principal works which will be carried out during 1915 are the erection of a three-cell refuse destructor; making up of private streets, and laying surface-water culverts in connection therewith; and the extension of buildings, cart sheds, steam-roller shed, and other works at the depot adjoining the council offices. Application has been made to the Local Government Board for permission to prepare a town planning scheme for the district. The other works will be mainly of a routine character.

Newport Pagnell (Mr. C. A. Branford, surveyor and sanitary inspector to the urban district council).—The various works contemplated by the council during the ensuing year are street improvements and an addition to the town water supply. Boring for water has commenced.

Norfolk (Mr. T. H. B. Heslop, m.inst.c.e., county surveyor).—In addition to the ordinary work of maintenance of the 1,412 miles of rural main roads under direct control, there will be considerable lengths of flint-surfaced roads reconstructed in granite. Improvements will be carried out by removing dangerous corners and widening narrow places, more especially upon the coast roads. About 80 miles of road will be improved for military purposes. In order to relieve distress caused by unemployment owing to the war, a large scheme of road widening in various parts of the county has been sanctioned by the authorities, and will be put in hand when distress arises. About 720 miles of road will be surface-tarred. Short lengths of "permanent" macadam surfaces will be laid down, and the general work of repairs to the 614 county bridges will be carried out. The existing private bridge across the river Ant at Ludham will be rebuilt, and subsequently taken over as a county bridge. The joint bridge at Mendham will be completed. Schemes will be prepared for bridging some of the remaining fords on the county main roads. The usual work of renovation and repairs to the county asylums, police stations, shire halls, and roadmen's cottages will be undertaken. New kitchens and nurses' accommodation will be completed at the asylum, and possibly the reconstruction of the drainage system undertaken. The building of further cottages for the police and county roadmen will be considered. Increased accommodation will be provided at one or two of the smaller police stations. The internal decorations of the Norwich Shirehouse, which has recently been restored and refronted, will be undertaken.

Northampton (Mr. Alfred Fidler, m.inst.c.e., borough engineer and surveyor).—The works under consideration for execution during the year comprise: Workmen's dwellings; pavilions at infectious diseases hospital; public baths; main drainage works; and road improvement schemes, including an important road towards which the Road Board have made a substantial grant. It is expected that the tramway extensions, which have been under construction in Kingsthorpe and Far Cotton districts, will be completed and in full operation early in the year.

Northamptonshire (Mr. C. S. Morris, county surveyor).—The present will be a busy year in this county. In addition to the repair of 320 miles of main roads, the widening and resurfacing of 40 miles of main roads now traversed by motor-'bus traffic will be in hand. A scheme for widening 126 corners on the main roads, and 281 corners on the district roads, at an estimated cost of £6,500, has been approved by the Road Board, who have made a grant of 75 per cent of the estimated cost (exclusive of land). The works have been commenced, and will continue throughout the year. The widening of Manor House Hill at Irthlingborough, at a cost of £1,200, will also be taken in hand, in addition to many other schemes of road widening and improvement. Schemes are in preparation for the widening and strengthening of several county bridges; of which there are 235 in the administrative county. The enlargement of Wellingborough police station, including the provision of two new courts, new cells and a mortuary, at a total estimated cost of £7,000, is in hand, and the work is expected to be completed by the end of the financial year 1915-16. The council have purchased a large block of buildings adjoining the county hall, with a view to the provision of additional offices for the staff, and the plans and specifications for this work are being prepared.

Norwich (Mr. Arthur E. Collins, m.inst.c.e., city engineer).—It is anticipated that the following municipal works will be commenced, proceeded with, or completed during the next twelve months—viz.: An application for Parliamentary powers for widening and deepening the river Wensum through Norwich. The proposed minimum width of river is 80 ft. The proposed depth is 17 ft. below mean water level between Foundry Bridge, the nearest fixed bridge, and the sea. Above this bridge 10 ft. depth is proposed. The scheme includes constructional works in respect of seven bridges. If distress labour requirements have to be met, it is possible to employ a considerable number of men on suitable portions of this scheme. The estimated cost of the portion now contemplated is £140,000. There is an ultimate scheme for widening and deepening about 23 miles of river between the city, at Foundry Bridge, and Breydon Water, near Great Yarmouth, at a further cost of about £200,000. A commencement will be made with the erection of additions to the municipal offices. For the cost of this work the Local Government Board has given its consent to raising a loan of £12,800. Following on the purchase of 130 acres of land on the north-west side of the City Asylum, progress will be made with plans for great extensions of that institution. Further consideration will be given to a scheme for erecting cottages and flats for the working classes in the northern portion of the city to provide housing necessitated by the demolition of houses in ancient courts and yards. The proposals at present being reviewed, including the clearance scheme, are estimated to involve an expenditure of about £10,000. Accommodation has to be provided for 115 persons. Plans and estimates are being prepared for the conversion of the riverside site of another clearance area into a macadam and wharf and refuse-loading dock. The proposals include the removal of old buildings, constructing electric transporter and storage hoppers from which to load steam wagons by gravitation in a few seconds each, dredging river, and constructing river wall. A contract has been let for adapting a former eye infirmary to the purposes of a tuberculosis dispensary, and the works are now commencing. Further progress will be made with the substitution of a bituminous macadam for ordinary macadam. The further assistance of the Road Board will be sought in the endeavour to continue to improve the status and convenience of main roads by the provision of this material. A roadway adjoining Wensum Park will be widened, and fencing and planting adjoining the widening will be effected as adjuncts thereto. It is expected to complete the extension of Unthank-road storm-water relief sewer (estimated cost £3,000), and thereby complete the last important link of the main surface-water sewerage of the south-western area of the city. The war and the possibility of raid or invasion affects the work of the department in organising help to the population if required.

Nuneaton (Mr. F. C. Cook, assoc.m.inst.c.e., borough surveyor and water engineer).—The works contemplated for 1915 comprise the conversion of contact beds into percolating filters at the sewage outfall works; the construction of 24-in. storm-water sewers for Coton-road district; the erection of public mortuary; the laying out of addition to Riversley Park; completion of the Newdegate Corner improvement, at a cost of £8,500; and other street improvements. The

Council have adopted a housing scheme providing for the erection of eighty-three houses, but it is held up owing to the war. The art gallery and museum [illegible] by Councillor Mellr, will be opened during the year.

Nottinghamshire (Mr. E. P. Hooley, M.Inst.C.E., county surveyor).—Plans have been prepared and submitted for a further extension of the county asylum at Radcliffe-on-Trent, this being the second extension within three years. Sites have been, or are being, obtained for the erection of [illegible] at Bassetlaw, Worksop, Carlton near Nottingham and Mansfield. Work [illegible] and other improvements are being carried out under Road Board grants, and [illegible] the proposed erection of 20 miles of rural main roads and the other for the reconstruction of 24 miles of urban main roads. Both are in Tarmac, and the completion is to take place in three years. One-third of the work will be completed by March 31, 1915, and it is anticipated that of the remaining portion one-half will be completed during the ensuing year.

Oadby (Mr. William Bell, engineer and surveyor to the urban district council).—It is proposed to erect primary and secondary filter-beds at the sewage works, owing to the unsuitable nature of the land, and the small [illegible] the effluent discharges. Additional pumping plant will be installed for the [illegible] level field, and the conversion of the present tanks into storm-water tanks. In connection with this scheme it is proposed to sewer the Wigston-road area, and thus reduce the use of cesspools in the district to a minimum. The council are also considering the taking over of the whole of the private streets in the Stoughton estate, which were recently made up, also the making up of several other streets in the district, and various other improvements to the Wigston and Stoughton roads, after the laying of the sewerage. It is intended to have a new heating apparatus for the public baths.

Okehampton (Mr. D. V. Howard, borough surveyor and waterworks engineer).—As far as can at present be ascertained, the following matters will receive the attention of the town council during the coming year: Extensions of and additions to the pen accommodation of the cattle market, and the provision of an auction ring in the market; the provision of hot water heating apparatus to, and the laying of a wood-block floor in, the market hall; scraping internally some of the existing water mains, and taking up and relaying the existing mains (which have been laid over forty years) in a large number of streets in the borough; and a scheme to increase the flow into the water supply storage reservoir, and repairs to the reservoir. The council have purchased a site for the purpose of erecting new public buildings.

Ossett (Mr. H. Holmes, M.Inst.C.E., borough surveyor and water engineer).—The early part of the year will see the completion of the extensions to the Storrs sewage works, including [illegible] ing new precipitation tanks and percolating filters. Many private street improvement works are in preparation, and these will be proceeded with at the end of the war. A new elementary school, to accommodate 450-500 scholars, is to be built, and the grammar school premises are to be extended. A surface-water sewerage scheme is to be prepared during the year, and there is every prospect of a town planning scheme, embracing at least one large area in the borough being taken in hand. Regulations have been prepared under the Ossett Corporation Act, 1914, and steps are to be taken to regulate the discharge of trade effluent into the sewers, and to make a charge for treating same. There will be the usual maintenance and routine work in the water department, and further extension of the mains where new buildings demand it. The usual maintenance of the highways includes tar-painting and the laying of tarred slag on both main and district roads. The revision of the building by-laws are now well in hand.

Oswestry (Mr. G. William Lacey, borough surveyor and water engineer).—Apart from routine work and some private street works, it is not anticipated that any large special works will be undertaken. It has been decided to postpone the proposed reconstruction of the service reservoirs for the present on account of the war. A large military camp is being established on the outskirts of Oswestry, and in addition it is proposed to billet a considerable number in the town. The swimming baths are to be opened for the season free of charge, and the presence of troops will naturally add a good deal to the supervision and routine work of the town.

Oxford (Mr. W. H. White, M.Inst.C.E., city engineer).—Among the works undertaken during the [illegible] a considerable outlying suburb, and its connection with the city [illegible] farm under-drainage system and of the city sewers and water mains; improvements of the pumping machinery; and the [illegible] sewer [illegible]. New [illegible] omnibus service has been established throughout the city under Parliamentary powers, the tramway track will be removed, and a complete scheme carried out for re-making and improving the roads traversed by the lines. An application has also been made to the Road Board in connection with a scheme for re-making all the main suburban roads.

Penrith (Mr. J. J. Knewstubb, A.R.I.B.A., M.R.San.I., engineer and surveyor to the urban district council).—The council's works for the ensuing year are not yet decided upon, and it is as yet difficult to say, considering all the circumstances [illegible]. The chief works will probably include the planting and laying out of about 7 acres of ground adjacent to Penrith Castle as a public park. The Castle itself is under the control of H.M. Office of Works, and works of excavation and preservation will also be proceeded with in connection with the structure.

Peterborough (Mr. J. W. Walshaw, city surveyor).—A new cemetery is in course of construction, and will be proceeded with during the spring. The cost of the land, 47½ acres in extent, has been £5,000, and a like amount will be expended upon the drainage, laying out, planting, buildings, and fencing of about 10 acres. A further extension of the surface-water drainage scheme in the borough will be proceeded with, and concrete in situ footpaths put down. A public urinal will be constructed, the cost of which will be £100. The fitting up of eight slipper baths for the soldiers which are now billeted in the city has been completed. Should the accommodation be found insufficient, a further number of baths will be fixed.

Portsmouth (Mr. Arthur W. Ward, Assoc.M.Inst.C.E., borough engineer).—The scheme for enlarging the infectious diseases hospital is now so far forward that the quantities have been taken out and the work advertised. Several schemes for works have been discussed, but, owing to the war, these will probably not be decided on at present.

Prescot (Mr. Richard Norris, A.R.San.I., surveyor to the urban district council).—Early in the year the new roadway from the station to the main road will be constructed. It is expected that twelve cottages will be completed at an early date. Improvements are to be carried out at the sewage works, consisting of providing tanks and weirs, and new single [illegible]. A new 18-ft. wide roadway will be made to the new gas works. The estimates for works on main roads have

not yet been submitted, but it is expected that these will include a number of sett pavements on concrete works. A scheme has been submitted to the council for converting 800 privies in the town into water-closets, and it is likely that the work will be carried out during the year. It is proposed to make up a number of back passages by paving under the Private Street Works Act, at an estimated cost of £600.

Preston (Mr. Thomas Cookson, borough engineer). Streets improvement, £13,000; widening of Glover's-court, £6,000; bowling greens, Ribbleton Park, £700; small-pox hospital, £2,100; sanatorium (including site of about 10 to 12 acres), £10,000. Tenders have been invited for the long-delayed baths (£20,000), and tramways offices and extension of car sheds (£7,000).

Prestwick (Mr. Frank Pritty, burgh surveyor).—The corporation are at present considering the necessity of providing increased clear water storage and filtering capacity. This will mean the construction of a clear-water tank giving five days' storage, and several sand-bed filters. The corporation have recently purchased property in the main street to effect a road widening and improvement, and it is proposed to build properties on the ground which remains after this improvement has been effected. Negotiations are proceeding for the construction of several new streets as private improvement works.

Pwllheli (Mr. C. L. Roberts, borough surveyor and water engineer).—During the year the west end and south beach promenades will be joined. This work entails the erection of a sea wall, and the formation of a parade and roadway, which is estimated to cost £4,000. The length of the promenade will be about ¾ mile after the work now in hand is completed. In order to relieve the distress in the neighbourhood arising out of the war, the work is being carried out by direct labour, and a substantial contribution towards the cost has been promised by the Road Board. The question of providing workmen's dwellings is becoming a serious one, and no doubt some definite steps will be taken in the matter.

Ramsgate (Mr. T. G. Taylor, borough engineer). The works projected in Ramsgate during 1915 include the following: Extension of bathing station and sea-bathing arrangements generally; lavatories (ladies' and gents'); important street widening works; relaying the considerable areas with wood paving; shelters on West Cliff, and improvement of road surfaces.

Rawmarsh (Mr. J. A. Tongl, engineer and surveyor to the urban district council). The works contemplated include a new sewage scheme for the South Ward of the parish and a new refuse destructor. Many new street works have been carried out under the Public Health Act and Private Street Works Act, and extensive street widening and paving works on main roads; also additions to gasworks offices. Considerable painting and decorative contracts and much routine work will be put in hand.

Rawtenstall (Mr. Jas. Johnson, borough engineer and surveyor). During the year the bowling green in Whitaker Park, which was projected to provide work for persons thrown out of employment by the war, and the main sewers in Bury-road and Townsendfold, will be completed. Surface-water drainage of the main roads will be proceeded with, in connection with which about 6 miles of 12-in., 9-in. and 6-in. sewers and drains will be laid. An important widening of Burnley-road East will be proceeded with. Ewood Bridge-road will be reconstructed. The question of the reconstruction of various main roads with granite setts will be considered. Several private streets will be sewered, paved and flagged. The Health Committee are considering the desirability of erecting more cottages for the housing of the working classes in the eastern part of the borough, and the scheme may develop. It is probable that new conveniences will be erected at Crawshawbooth.

Redcar (Mr. J. Howerott, engineer and surveyor to the urban district council). The works contemplated are: Private improvement works; shaft and borehole, and pumping apparatus at waterworks; and new water mains.

Rochdale (Mr. S. S. Platt, M.Inst.C.E., F.R.San.I., borough surveyor).—It is intended, during the coming summer, to proceed with the work of construction of the second portion of the extensions at the sewage disposal works at Roch Mills, consisting of a further thirteen revolving percolating filters, 72 ft. in diameter, 9 ft. deep (making twenty-six in all), having gas coke, 1¼-in. gauge and above as a medium, so as to enable the volume of sewage up to three times dilution to be treated (about 7,000,000 gallons per day). The scheme also includes the duplication of the main outfall, so as to be capable of delivering six times the normal flow, with allowance for future increase. The first portion of the extensions referred to—they are illustrated in The Surveyor of June 20, 1913—has given very satisfactory results, the effluents being well within the requirements of the Mersey and Irwell Joint Committee. The conversion of pail-closets in the borough to the water-carriage system is progressing, one result being an increasing amount of precipitated sludge at the sewage works, and the question of its disposal is requiring reconsideration. At present the sludge is dealt with in six filter presses, and the disintegrated sludge cake is given to farmers; but the difficulty of disposal locally is becoming more accentuated, and the corporation have entered into an agreement (and the work is now in progress) for the installation of an experimental plant for the recovery of grease from the precipitated sludge, and the production of a fertiliser containing not more than 10 per cent of moisture of greater manurial value than ordinary sludge cake obtained by pressing. A sanatorium of forty-eight beds and ten shelters is to be provided for tubercular cases on an estate of 100 acres at Springfield, recently acquired by the corporation. A necessary addition is to be made to the tramway department by the erection of repair shops and car shed on lands of the corporation adjacent to the present offices and depot, at an estimated cost of £17,000. The extension will be proceeded with of the ferro-concrete covering of the river Roch, to a distance of 30 yds. opposite the town hall, alongside the site of a new general post-office, the erection of which is expected to be commenced this year. With a view to finding work for unemployed, plans and estimates have been submitted to the Local Government Board, and their sanction obtained, for the construction of two bowling greens and some levelling on one of the recreation grounds of the corporation, but the immediate carrying out of these works will depend on the amount of distress prevalent in consequence of the war. At present there is no marked distress. The construction of a new main road, 20 yds. in width, and about 1½ miles in length, between Castleton and Lowerplace, at an estimated cost of about £40,000, the plans and estimates for which are awaiting the approval of the Local Government Board, is in the same category as the works just referred to. Sundry street widenings are in progress and in contemplation. The second town planning scheme of the corporation, comprising about 1,600 acres, of which about 500 acres are in the area of two adjoining authorities, having received the authority of the Local Government Board, the corporation will now proceed to the next stage, viz., the preparation of a scheme.

Rotherham (Mr. Ernest B. Martin, M.Inst.C.E., borough and waterworks engineer). The works contemplated for the present year include numerous private street works and the construction of a new 60-ft. road through a part of the town. The improvement of several main thoroughfares, more particularly in College-square, will be carried through. The sewage disposal works will probably be extended by constructing further percolating beds and the construction of detritus tanks. The corporation are considering a small housing scheme and the preparation of a town planning scheme. The tramway system will probably be extended under powers now being sought in Parliament, and existing powers for the laying of a short tramway in the centre of the town will probably be exercised. Extensions to the car sheds and electric power station are approaching completion. The removal of the cattle market from its present site to one alongside the river will probably be taken in hand. Extensions to the waterworks are now taking place

by direct labour, and a new reservoir, with a capacity of 1,000,000 gallons, is being provided [illegible] with a small pumping station.

Rugby (Mr. JNO. H. SHARP, water engineer and surveyor to the water district council).—The past year has been one of considerable activity, particularly in respect of building operations and the opening up of new building estates, one of which has been completely built up, two more are rapidly nearing that state. The opening up of these estates has involved about 3 miles of streets to the existing public highways of the district, bringing the mileage up to about 25 miles. Although 3 miles is a large mileage of main roads. The [illegible] in the district were tar-sprayed during the summer. It is expected they will be again so treated this season. Several lengths of tar-macadam have been laid down in the centre of the town, which has proved most satisfactory, and no doubt will be laid down to a greater extent as soon as the season is sufficiently advanced for the successful carrying out of this class of work. New pumping plant [illegible] turbo-pump by Messrs. Willans & Robinson, Limited, Rugby) was installed at the Avon waterworks pumping station, at a cost of £4,200, capable of pumping a minimum of 30,000 gallons per hour, and a maximum of 75,000 gallons per hour. This plant is giving good results. In addition to the ordinary routine (no little matter in a rapidly growing town of this description), the department has been responsible for the carrying out of many important municipal undertakings, which included large alterations and additions to the depot and fire station, the reforming and asphalting of the paths in the Caldecott Park, laying down of a bowling green, and the erection of a pavilion. Works which will be put in hand during the year 1915 comprise the erection of a disinfecting station. The type of disinfector which will be installed is the Alliott & Paton high-pressure machine, fitted with recording gauge and Formalin spray attachment. The projected schemes include the construction of two large filter-beds, 96 ft. by 50 ft., at the Avon waterworks, together with other works appertaining thereto, including retaining wall running alongside the bank of the river Avon, taking out existing supply pipes, and replacing with pipes and valves of a larger diameter, and the conversion of an existing primary filter-bed into a secondary one. Plans have been prepared for the erection of a public convenience for ladies and gentlemen, at a cost of £800, which work will be put in hand as soon as the sanction of the Local Government Board has been obtained. An inquiry has recently been held for the borrowing of £8,500 for purchase of about 34 acres of land, which will be laid out in allotments, cemetery, pleasure grounds, and a site for a building scheme for fifty-three cottages having 16-ft. and 18-ft. frontages. The preparation of the plans for the laying out of the estate together with the plans of the cottages, is well in hand. Extensive alterations and additions will be made to the cattle market, which will comprise the erection of twenty-two large sheep pens, eleven pig pens and shed, and twenty-two large cattle pens, the floor of standings and avenues being carried out in concrete. It is anticipated that the surface-water drains in certain parts of the district will be taken up and relaid. Part of this work is now in hand. Preparations have been made (if necessary) for carrying out a large amount of extra work for the relief of unemployed in the town caused by the war. This includes the construction of a new road, levelling of about 6 acres of land at the sewage works for irrigation purposes, improvements to various highways, footpaths, street corners, and other minor works.

Ruislip-Northwood (Mr. W. LOUIS CARR, M.I.M. AND CO.E., engineer and surveyor to the urban district council).—During the year the council propose carrying out the following works: Extension of sewage disposal works, £5,000; sewerage, £2,750; repair of old sewers; road widenings, £400; highway repairs, £4,000; tar-painting roads and paths; private street works; lay-out of recreation ground at Ruislip; scheme for the building of twenty-two workmen's dwellings; and the preparation of a further town planning scheme.

Ryton (Mr. JOHN P. DALTON, engineer and surveyor to the urban district council).—Owing to Captain Dalton being on service with the Territorial Force, and the present crisis, no works of a special character will be carried out during the coming year. A housing scheme was postponed indefinitely, but should matters [illegible] will be proceeded with [illegible] twelve months' time.

St. Annes-on-the-Sea, Lancs (Mr. J. STANLEY SAXTON, ASSOC.M. [illegible], engineer and surveyor to the urban district council).—The works proposed to be carried out at Lancashire's residential suburb, and one of the newest, pleasantest and healthiest coast towns in England, are of considerable importance. Ashton Gardens, purchased for £25,000, and presented to the town by Lord Ashton, will be laid out. In the centre of the gardens, occupying an elevated position, Ashton Hall is to be erected at a cost of £22,000. The building, which is of a very ornate design, will be magnificently situated, built of stone, surmounted by a dome, and is intended to be a summer pavilion, which can be adapted for stage plays in the winter. The gardens are being laid out at a cost of £13,500, and include an ornamental lake, artistic bridges, cascades, rock, flower and formal gardens, with carpet bedding, shrubberied walks, surrounded by high banks and cliffs, and it is hoped that the reflection of the hall and terraces in the lake will be a means of blending the whole scheme, and rendering it at once a complete example of architectural perfection and pictorial treatment. Plans have been approved by the Local Government Board for an open-air swimming bath on the [illegible] 200 ft. by 120 ft. wide. The scheme is estimated to cost £8,500, and includes dressing-rooms for ladies and gentlemen, café and lounge, and children's playground. A salt-water supply scheme is under consideration for watering the streets with salt water. Plans have been approved by the Local Government Board for a new drainage scheme to cost £40,000. Other works contemplated include depot buildings (£1,000), underground conveniences (£1,600), private street works (£15,000), destructor (£8,000), greenhouses (£300), ten tennis courts (£900), bowling pavilion (£250), North Promenade Gardens (£600), and various smaller schemes.

St. Austell (Mr. E. D. GROVES, M.I.M. AND CO.E., A.R.SAN.I., engineer and surveyor to the urban district council).—The work of street improvements and road widenings will be continued. Owing to unemployment, several schemes have already been started. The East-hill main road widening is being done, at an estimated cost of £525, which includes widening the road about 10 ft., and the construction of new footways. The kerbing and channelling will be of granite, with cement-concrete paths laid in situ. The High Cross-street widening and improvement has also been started. This has necessitated the demolition of six houses, the new frontage line being set back about 10 ft. The carriageway will be made to a width of 25 ft. throughout, and a new footway constructed with 12-in. by 7-in. granite kerbing and 14-in. channelling. The cost of this improvement, including compensation, will be about £850. These works are being carried out departmentally. The council's first housing scheme will be completed early in the year. The scheme was prepared by the surveyor to the council, and received the sanction of the Local Government Board without alteration. In laying out the site, care was taken to avoid a cold and mechanical uniformity. For this reason the houses are not placed fronting the adjoining roads, but some are arranged at angles to the others. The houses are arranged in five blocks, four of the blocks each having four houses and one having six houses—twenty-two houses in all. The houses contain living-room, scullery, with larder, coal store, cupboard and water-closet on ground floor, and three bedrooms on the first floor. The cost of the site was £307. The contract for buildings, sewers, roads and fencing is £4,594. The rent (on a self-supporting basis) is 5s. 4d. per week inclusive. The recreation and pleasure ground, which was presented to the town last year by Sir C. J. Groves-Sawle, Bart., is at present being laid out. Sir Francis Leyland Barrett, Bart., has given a large shelter for the grounds, which is being erected to the designs prepared by the surveyor to the council. A public convenience for the grounds is being erected by the council. A new street will be made up, the work being done departmentally. The provision of an isola-

tion hospital, also new depot and stables, are under consideration.

St. Ives (Mr. SIDNEY PALMER, M.I.M. AND CO.E., P.A.S.I., borough surveyor and waterworks manager).—The council are now carrying out extensive road widening and improvement works on the St. Ives—St. Just road, from just above the board school in the Stennack to the top of Trevalgan Hill. It is also intended to commence a new sea wall and roadway at the harbour.

Saxmundham (Mr. J. E. HATTERSLEY, M.I.M. AND CO.E., engineer and surveyor to the urban district council).—The council's works for the year 1915 will include the completion of a new waterworks, pumping station, and the laying of cast-iron water mains and fire hydrants throughout the town at a cost exceeding £6,000. A new fire engine station and depot, and the reconstruction of several roads has also been approved by the council.

Sheffield (Mr. C. F. WIKE, M.INST.C.E., city engineer).—In addition to the usual routine work of the department, including sewage treatment, a scheme for the secondary treatment of sewage, at an estimated cost of £70,000, is to be taken in hand during the year. Several important street-widening schemes are to be taken in hand, at an estimated cost of £100,000 together, with a number of smaller improvements, powers for which were included in the Sheffield Corporation Acts, 1912 and 1914. A scheme (estimated to cost upwards of £250,000) is also in hand for the widening of two important thoroughfares, and providing a large open square at the very busy junction of the streets. With two exceptions the whole of the properties to be demolished have been acquired by the corporation. A portion of the river Sheaf is to be covered over in connection with the scheme, at an approximate cost of £10,000. A considerable amount of work is in progress in connection with town planning, and will be proceeded with during the year. The total area of town planning schemes at present in hand in Sheffield is about 6,000 acres. The widening of two bridges over a railway and canal, at an approximate cost of £15,000, and the widening of two bridges over the river Don, at an estimated cost of £14,000, will probably be taken in hand during the coming year. Public conveniences are to be erected in various parts of the city, at an estimated cost of £3,500. In addition to the ordinary work in connection with parks and recreation grounds, the construction of several bowling greens is contemplated, together with pavilions and conveniences, at a total estimated cost of £2,000. Sanction has been received from the Local Government Board for laying out a cemetery at a cost of about £6,000: the work is in progress, and will be proceeded with during the year. A plot of land has been purchased, at a cost of about £3,800, for the purpose of providing allotment gardens in the eastern portion of the city, and it is probable that the greater portion of the land will be laid out during the forthcoming year.

Sheffield (Mr. W. J. HADFIELD, city surveyor).—During the year a further reorganisation of the corporation departments has taken place, with the result that Mr. W. J. Hadfield has been appointed city surveyor, and the scope of his department has been enlarged. For the general maintenance and upkeep of the 340 miles of adopted streets in the city during the year a sum of about £50,000 will be required, in addition to which £30,000 is to be spent on private street works. Considerable progress has been made with the scheme for road construction amounting to £40,000, towards which the Road Board made a grant of £17,000. About half the amount has now been spent. Probably from £15,000 to £20,000 will be spent during the year upon sewerage works. An extension of the Ecclesall tramway route is to be taken in hand, which, together with the repairs and renewals, will account for an expenditure of probably £45,000 upon tramway work. There are a number of smaller works on hand, which, together with street cleansing, estimated to cost £31,000, will probably bring up the total expenditure of the department for the year to about £240,000. This is a considerably less total than that estimated for the previous year, but the fact that work has been promised on their return to about 250 men belonging to the department who are now with various branches of His Majesty's Forces, has caused the cutting down of expenditure for the present, the object being to save as much work as possible for these men when they return, rather than create works solely for the purpose of keeping them employed.

Sheringham (Mr. F. HALL SMITH, M.I.M. AND CO.E., P.A.S.I., M.R.SAN.I., engineer and surveyor to the urban district council).—Sanction has been received from the Local Government Board for a loan of £900 for surface-water drainage, and this work will no doubt be carried out. Owing to the war, the council will not be carrying out extra work. At the present time the depot and storeyard are being enlarged.

Shrewsbury (Mr. A. W. WARD, ASSOC.M.INST.C.E., borough surveyor).—Several roads in the borough will be strengthened in the foundations and remade; a tender has been accepted for sewering a growing suburb, and the work will be shortly put in hand. Preliminary work is in progress with a view to the preparation of a town planning scheme, and a further housing scheme is under consideration. A tender has been provisionally accepted for the installation of a filtration and aëration plant at the public baths. Private street improvement works are also in hand.

Skegness (Mr. R. H. JENKINS, engineer and surveyor to the urban district council).—Several private streets will be made up during 1915, and the widening and improvement of Wainfleet-road continued. A committee has just been appointed to report as to the advisability of applying for permission to prepare a town planning scheme for portions of the town. The following works are also under consideration—viz., improvement of parades, screening apparatus and an compressor at sewage pumping station, alterations at the sewage farm, and several water main and sewer extensions. A Bill is being promoted in Parliament this next Session for the acquisition of the gasworks, following the council's successful opposition to the company's Bill during the 1914 Session.

Skipton (Mr. ARTHUR E. W. ALDRIDGE, surveyor and waterworks engineer to the urban district council).—Extensions at the sewage disposal works are to be carried out, consisting of additional tanks, filters, humus tanks, sludge lagoons, and pumping-house. The deviation of the Keighley and Kendal main road for a distance of 600 yds. is to be put in hand, and main road widening and bridge reconstruction in the south of the town.

Somerset (Mr. EDWARD STEAD, ASSOC. M.INST.C.E., county surveyor).—The strengthening, draining and laying of improved surfacing materials will be continued on some of the more important main roads with the aid of grants from the Road Board. It is probable that extensive improvements by widenings and deviations will be taken in hand on the Taunton to Minehead and the Bridgwater to Minehead main roads. A large extension of surface tarring is contemplated, an aggregate length of about 160 miles being proposed for treatment. A tar-macadam plant will be installed in the division under the direct control of the county council, and careful trials are to be made of tarred limestone macadam. The usual expenditure of about £4,000 will be incurred in rebuilding and strengthening bridges. Six cottages for roadmen are to be erected for the county council's men, together with a central depot for the Long Ashton division.

Southam (Mr. HERBERT PICKERING, surveyor and inspector to the rural district council).—In addition to the maintenance of existing works and smaller improvements, a scheme is being prepared by Messrs. Taylor & Wallin, engineers, Newcastle-on-Tyne, for supplying the town of Southam with water obtained from a new well sunk in the Holy Well field. This supply was found after a number of experiments carried out under the instructions of a Special Committee, and the final result exceeded all expectations, a yield of 108,000 gallons per twenty-four hours being obtained. Only 30,000 gallons per twenty-four hours is required for Southam. The estimated cost is approximately £4,000 and it is hoped the work will be commenced during the ensuing year.

Southampton (Mr. J. A. CROWTHER, borough engineer and surveyor, and architect to the Education Committee).—Private Street Works Plans are not made [illegible] being prepared for a portion of private streets. Contracts are in hand for two streets. Schools: Tenders have been received for the construction of an elementary school for 1,200 scholars. This work will commence at once. The council have under consideration the building of another elementary school for 1,250 scholars, which will no doubt be proceeded with during the year. Asphalt and Tar-macadamising: A large area of carriageway was treated during 1914. An application for an extension to borrow £32,000 for this class of work is now before the Local Government Board. Disposal Works: Work is proceeding with the reconstruction of a ferro-concrete quay wall at the principal depot on the river, in substitution of old wooden piling and sheeting. The council have under consideration schemes for modernising the disposal of the sewage of one of the suburban districts of the borough. Refuse Destructors: A refuse destructor plant, consisting of six cells, two boilers, and chimney shaft, is being laid down at one of the depots. Hospitals: Plans for a tuberculosis hospital are now before the Local Government Board. This will be proceeded with as soon as sanction has been received. Thirty-six acres of land have been purchased for hospital purposes. A tuberculosis dispensary and [illegible] in full working order, and supplies a long-felt want. A scheme has been prepared for doubling the laundry accommodation at the isolation hospital. Sewers: The [illegible] carried out during the year. Flood prevention works are in progress in one of the low-lying districts of the borough (comprising 80 acres of fully built-upon land) which is occasionally flooded with tide water. The greater portion of the land is very little above the level of high water ordinary spring tides. Housing: Application is before the Local Government Board for sanction to purchase 36 acres of land for housing purposes, and the council are about to invite tenders for the erection of fifty houses. Baths: Designs have been prepared and are now before the council, for the erection of slipper baths in one of the suburbs, with the usual offices and residents' quarters.

Southend-on-Sea (Mr. ERNEST J ELFORD, M.INST.C.E., borough engineer and surveyor).—The works to be carried out during the year include the resurfacing with bituminous material and partial reconstruction of 5¾ miles of main road, at a total cost of £21,800; the erection of electricity sub-stations in the Leigh and Thorpe Bay areas (£8,900); retort and retort-house extensions at Leigh gasworks (£3,340); reconstruction of a large refreshment room on the recently completed portion of the pier head (£2,000); shelters on the esplanades (£3,650); reinforced-concrete shelter on the cliffs (£3,500); public conveniences and lavatories on the pier head (£850); and two underground conveniences in Leigh and Westcliff (£1,960). Surface-water sewerage in the East, Central and Leigh areas, costing £12,300, will be commenced. A cast-iron rising main for the supply of well water from the site of the sewage disposal works to the electricity works will be laid early in the year (£2,750). Road improvement and tramway track doubling in Leigh Broadway (£10,500) will be carried out early in the year. Private street works will proceed as usual, and the expenditure for this purpose will probably be about £35,000. Considerable lengths of highways will be resurfaced with tar-macadam or bituminous materials. A commencement will probably be made with the construction of a new highways depot, including stables, motor sheds, workshops, and stores. Other works in contemplation include a tuberculosis hospital and the erection of twenty-four dwellings for the working classes.

Sowerby (Mr. JOHN SMITH, surveyor and inspector to the urban district council).—The construction of 9-in. and 6-in. earthenware sewers, and about 1,000 lin. yds. of branch drains, has been put in hand, the estimated cost of the work being £4,300. Other extensions to sewers are contemplated. A public water supply is under discussion, but nothing definite has been arrived at. Halifax Corporation are seeking powers to extend their tramways still further through the district. Other works contemplated, but not yet decided upon, are the laying of tar-macadam and surface tarring, and improvements to the footpath on the main road, putting up a further section of setts and laying macadam; road widening at Sowerby Green, and improvements to roads generally throughout the whole district.

Southport (Mr. A. E. JACKSON, ASSOC.M.INST.C.E., borough engineer and surveyor).—The works for the sewerage of Ainsdale and Birkdale are in course of construction. The corporation have in hand a scheme for laying out, as public parks and gardens, an area of 60 acres on the foreshore, and also a further section of the new gardens in Lord-street. The council have accepted plans for a new technical school, and have before them schemes for the remodelling of the municipal buildings and the construction of a new market on the Market Hall site. They are also proceeding with a scheme for the town planning of the whole of the borough.

South Shields (Mr. LESLIE ROSEVEARE, M.INST.C.E., borough engineer and surveyor).—In addition to the usual routine work, the following schemes are in course of preparation or in hand: 190-bed fever and tuberculosis hospital; public mortuary; tuberculosis clinic; town planning scheme of 2,500 acres; borough extension; a 5-acre extension of the Marine Parks; completion of the additions to the electricity station; road and sewer diversions necessitated by the construction of a new 650-ft. dock; and diversion of three main roads out of the town, including a new bridge and tramway extensions. A Parliamentary Bill is being promoted in the coming Session for quay extension, road improvements, and further tramway extensions.

Southwold (Mr. JAMES S. HURST, M.I.M.S.P.E., borough surveyor).—Schemes in hand or contemplated for 1915 include a concrete sea defence, with undercliff promenade extending from a point in front of the Sailors' Reading-room to the south of the cliff known as Gun Hill; a concrete footpath to be constructed 3 ft. 6 in. wide on top of the mud wall, extending from the foot of Gun Hill to the lifeboat house. A footbridge over the Buss Creek will connect up two outlying parts of the district, and be of much service to the inhabitants. A roadway 30 ft. wide from the Promenade Pier to the Buss Creek is projected. The council also have in hand a scheme for laying out a portion of the Common as building land, but this is at present held up on account of the war. A storm overflow from the main sewer in Station-road is being considered, the present sewer not being large enough in heavy storms to take away water conveyed to it. During the past year the council have carried out a good deal of tar-dressing of roads, and this work will again be continued on a larger scale in the spring. The North Parade has been reconstructed. A new groyne has been erected on the beach, and a number of small improvements have been carried out. The sewage works, which had been a source of trouble for some time, have been entirely remodelled and reconstructed, and the council's housing scheme has been completed. Sir Ernest Clarke officiated at the formal "opening" of the houses in June last, and the introduction of the new steam fire engine, on the same date.

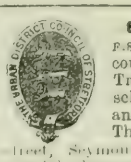
Stafford (Mr. WM. PLANT, ASSOC.M.INST.C.E., borough engineer and surveyor).—The remodelling of the borough hall, which is well in hand, will be completed. The reconstruction of the police station, including new cell accommodation, will be proceeded with. A scheme for the purification of the whole of the town sewage on bacteriological lines is in course of preparation, and will be commenced during the year. The new road across

the valley of the river Sow, nearly ½ mile in length, and raised from 6 ft. to 8 ft. above the surrounding land, will be finished in the Spring. A scheme is now before the Local Government Board for the extension of the boundaries of the borough from 1,084 acres to about 3,700 acres, and a local inquiry will be held at an early date. The laying out of the two corporation building estates will be proceeded with, and various street improvements are contemplated.

Stoke-on-Trent (Mr. A. Burton, Assoc.M.Inst.C.E., F.S.I., borough surveyor).—The ordinary maintenance of the 130 miles of roads in the borough will entail a large amount of expenditure due to the rapidly increasing heavy through motor traffic. A loan has been taken up, amounting to £10,100, for paving the main road between Hanley and Burslem with setts on concrete, this being the second portion of a considerable programme which has been laid down for paving the majority of the main roads in the borough. The widening of High-lane, which is a main road leading in the direction of Manchester, to a width of 50 ft., for that portion of its length which is within the borough boundary, is well in hand, and the widening of Stone-road and the bridge over the river Trent will also be put in hand. The active programme under the Private Street Works Act, 1892, will be continued. The two town planning schemes—one in the Burslem area and the other in Stoke area—will be proceeded with during the year. The laying out of a new park at Fenton has been commenced, and instructions have been issued for the preparation of plans and designs for a recreation ground at Goldenhill. The construction of the Burslem storm-water drainage scheme, which is being carried out departmentally at a cost of, approximately, £11,000, is well on towards completion, and further subsidiary sewers in connection with this scheme will be put in hand. An extensive storm-water scheme will receive attention for the surface-water drainage and storm relief to the existing sewers in Hanley, which is estimated to cost the sum of £16,000. Building operations in connection with the proposed alterations and additions at Stanfield Hospital, adapting this building for sanatorium purposes, are now being carried out, and the provision of tuberculosis branch dispensaries at Burslem and Longton is being considered. A new police station is being erected at Fenton, and arrangements are being made for alterations and additions at the Burslem Station. A new public convenience is in course of erection at Hanley. Alterations are to be made at the Butchers' Market, Burslem, for district finance offices. The re-roofing and alterations required for the adaptation of the old town hall, Burslem, for the purpose of a public library and district municipal offices is to be dealt with shortly. Arrangements are being made for the erection of a new fire station at Hanley, and a refuse destructor works at Tunstall. The provision of cold storage at Hanley abattoirs is under consideration, also the erection of a pavilion at Longton Park. Other proposed works include the erection of mortuaries for the Hanley and Stoke districts respectively, the erection of an additional block at the Fenton library to form juveniles' reading-rooms, the reconstruction of the roof of the Hanley Museum, and the formation of a new town yard and depot for the Stoke district.

Stratton and Bude (Mr. Francis J. Worden, surveyor and waterworks engineer to the urban district council).—The council have under consideration proposals for laying a new water main from Stratton to Bude, a distance of about 1 mile along a route which is likely to be developed for building purposes. The estimated cost, including valves, meters and hydrants, is about £900. Among other proposals are included extensions of sewers in the outlying parts of the district, and the possible development of a separate scheme at Upton Cliff. Works in connection with the making up of private streets will be carried out, and several street and other improvements are proposed.

Suffolk, East (Mr. Henry Miller, M.Inst.C.E., civil engineer and county surveyor).—There is nothing of special interest in progress this year. The only matter of importance is the erection of single cottages for police constables in country villages, where suitable ones are unobtainable.



Stretford (Mr. Ernest Worrall, F.S.I., surveyor to the urban district council).—A new elementary school in Trafford Park to accommodate 800 scholars is approaching completion, and will be opened early in the year. The widening of Edge-lane, King-street, Seymour-grove, and Upper Chorlton-road arterial thoroughfares communicating with adjoining districts is proceeding as frontages are acquired. A scheme for reinforced concrete settling tanks of 1,000,000 gallons capacity, and an electric pumping set at the sewage farm together with the acquisition of 45 acres of additional land, has been submitted to the Local Government Board, whose inquiry is shortly to be held, after which the work will then proceed. The usual batch of private street works scheduled for completion is held in abeyance pending the termination of the war. An artesian well has been sunk in Longford Park, and a compressed-air plant to lift the water supply therefrom to an elevated tank is to be installed. The erection of a new reinforced concrete and masonry bridge and approaches, 51 ft. wide between parapets, over the Bridgewater Canal from the Chester (main) road into Trafford Park is contemplated. It is proposed to complete the scheme under Part III. of the Housing of the Working Classes Act by the erection of fifty additional cottages in semi-detached pairs on the acquired site. The lighting of the main thoroughfares by electricity is to be improved. Smaller items of improvement and growing maintenance will add to a busy year's work.

Suffolk, West (Mr. W. Lionel Jenkins, Assoc.M.Inst.C.E., F.A.S.I., county surveyor).—The improvement and reconstruction of the main roads are being rapidly proceeded with, with the assistance of the Road Board. The Newmarket-Bury-Stowmarket road is complete, except for a small section near Kentford. The greater part of the Bury to Sudbury road is complete, as is also the Ixworth to Thurston road. Both the Stour Valley and Newmarket to Thetford roads are being dealt with, and long lengths of these roads have already been remade. Some 30 miles of roads in all have been reconstructed, with the help of the Road Board, within the last fifteen months. Modern methods of road making are being introduced, and the road labourers are being steadily trained by the county surveyor's department into skilled workmen. In addition to ordinary water-bound surfaces, certain lengths of road have received surface coats of tar-macadam, pitch-grouted macadam, and Reconstructed macadam. It is proposed to extend the area under surface treatment by tar in the coming season. A number of road widenings are being carried out on the Newmarket to Thetford road, and Thurston to Ixworth road. Kentford Bridge will probably be reconstructed during the summer. Eldo-road will be improved, with the assistance of the Road Board, and taken over as a county road. Extensive works of surface drainage are being carried out in Mildenhall and Brandon. West Suffolk roads are suffering severely by the extraordinary military traffic, and schemes are being prepared to provide for contemplated increase in the same.

Sunderland (Mr. J. W. Moncur, M.Inst.C.E., F.I.S.E., borough engineer and surveyor).—A new bow-string girder bridge is contemplated across the river Wear to supersede the old iron bridge built in 1796 and reconstructed in 1859. The new bridge will consist of three main girders. One girder will form the centre of the bridge, and will divide the north and south going traffic. The total width of the bridge will be 90 ft. 8 in. between the parapets, and it will have overhanging gangways on each side to carry water and gas mains. The plans have been lodged for this Session in Parliament, and it is expected the scheme will take three years to complete. Plans have also been prepared for large extensions to the town hall, but, owing to the war, nothing further has been done. Extensive additions are to be built at the borough sanatorium—viz., administrative block (twelve bedrooms), tuberculosis block (twenty-four patients), isolation ward, and the remodelling of the laundry. Sites have also been obtained for a day training college, with male and female hostels, also for a collegiate school for boys. Plans for these were approved by the council some time ago, and the

buildings will be commenced very shortly. The accommodation in the former is for 150 students, and in the latter 400 boys. Preliminary plans have also been prepared for open-air salt-water bath, and the continuation of the promenade at Rocket

Surbiton (Mr. HENRY T. MATHER, engineer and surveyor to the urban district council).—Progress will be made in the construction of a new cemetery, together with chapel, lodge, and sanitary block. The council having received [illegible] from the Local Government Board permission to prepare a town planning scheme for a portion of the district; it is hoped considerable progress will be made in the preparation of such a scheme. Certain street widenings and improvements and rounding-off of dangerous corners will be carried out.

Sutton Coldfield (Mr. W. A. H. CLARRY, ASSOC.M.INST.C.E., borough engineer and surveyor).—A number of works are being pressed forward to meet any demand that may be necessary for the relief of distress during the winter or the continuance of the war. At present the building of a refuse destructor in connection with the electricity supply station is well in hand, and the erection of a girls' cookery and laundry school, two boys' manual schools, and latrines in the park are being commenced. These, with the labour required for erecting the huts and headquarters to form two complete camps for the Birmingham City Battalions, who are now drilling in Sutton Park, will provide sufficient work for the district for some time. The further works that are in readiness are the widening, strengthening and surfacing of Tamworth-road for over a mile, the widening of Coles-lane, which includes the spreading of the surplus soil over the refuse-tip to provide allotments, and the dredging of one of the bathing pools in the park. These will be proceeded with immediately any distress occurs. Plans are also being prepared for new open-air swimming baths, and works of widening.

Sutton-in-Ashfield (Mr. WALTER BURN, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council).—The 33-in. concrete tube sewer has been put in, but is not being utilised till the sewage disposal works have been enlarged, which it is proposed to do at a cost of £20,000. There are now twelve streets in course of construction under the Private Street Works Act, 1892. It is expected the new post office will be erected during the coming summer, as well as a caretaker's house at the small-pox hospital. There are two or three road widenings and improvements contemplated; also a new sewer in Skegby-road, to take drainage from new works; but their being put in hand will depend a good deal on whether the war lasts. It is intended to fence the three recreation grounds recently given by the Duke of Portland to commemorate his silver wedding, and the coming of age of his son the Marquis of Titchfield. It is proposed to make extended use of tar-macadam and tar-spraying.

Swaffham (Mr. L. KEYWORTH BERRIDGE, surveyor to the urban district council).—In addition to the usual routine work, the council are taking up a loan for the laying out of a new cemetery. The housing question will also receive consideration.

Swindon (Mr. H. J. HAMP, ASSOC.M.INST.C.E., borough surveyor).—The new engineering laboratories at the technical schools, costing £4,500, are nearing completion, and will shortly be opened. The question of extending the town hall buildings is under consideration. The drainage of the farms at the waterworks, and new system of filtration for the town supply, will be considered by the council early in the year. New trunk water mains are to be laid in the borough, at an estimated cost of £2,300. Under the Swindon Corporation (Wilts and Berks Canal Abandonment) Act, 1914, the council have acquired that portion of the canal which is within the borough, a length of 3¼ miles, and the question of dealing with this section and the bridges which span it, also the provision of dams and gauges for supplying the canal outside the borough with water, will be considered during the year. A scheme for widening and improving the Wroughton-road from 24 ft. to 46 ft., at an estimated cost of £6,000, has been passed by the council, and the work will be put in hand forthwith. A further scheme for widening and improving the Stratton-road from 25 ft. to 46 ft. is being considered by the Works and Streets Committee. The work of making up of several private back roads will also be proceeded with.

Swinton and Pendlebury (Mr. HENRY ENTWISLE, engineer and surveyor to the urban district council).—The sanction of the Local Government Board has been obtained to the reconstruction of the sewerage system for a portion of the district, at an estimated cost of £10,857. A Local Government Board inquiry has been held into the application for sanction to borrow £8,245 for the erection of forty semi-detached cottages under the Housing Acts. In addition to the completion of private street works amounting to £7,560, further streets are to be completed at an estimated cost of £2,326. The widening of Deansroad, which necessitates the construction of a reinforced concrete wall across a reservoir, is being proceeded with.

Taunton (Mr. DAVID EDWARDS, ASSOC.M.INST.C.E., borough engineer and surveyor).—During the year the council propose commencing the work of the erection of new public baths at a cost of £3,500, and twelve additional workmen's cottages, for which application for a loan has been made. The construction of an overflow weir, 200 ft. long, over the river Tone, is in hand, and will be completed early in the year, the contractors being the British Steel Piling Company. A new house for the manager at the sewage works is also in hand, at a cost of £500. Last year a section of the main road in the centre of the town was laid with Roadamant, and it is expected that an additional length will be laid during this year.

Tenby (Mr. B. MORLEY, M.R.SAN.I., borough surveyor). — A housing scheme is in preparation for the erection of fourteen working-class dwellings, with new road and boundaries. There will be a further extension of about 700 yds. of water mains, and extensive repairs will also be carried out to the Royal Victoria Pier, including the replacement of the whole of the lower landing-stage. The work of reconstructing and extending the western sewerage outfall is in hand, and will probably be completed in 1915.

Tilbury (Mr. S. A. HILL-WILLIS, ASSOC.M.INST.C.E.I., M.R.SAN.I., engineer and surveyor to the urban district council).—The following work of improvement will be continued with the aid of Road Board grants—viz.: Strengthening foundations and surfacing with granite some 2 miles of district roads, estimated cost £3,440; and widening carriageway with hardcore foundation, improvement of gradient, and surface with granite ½ mile War Department road in South Ward. The whole cost of this latter section is to be defrayed by the Road Board. The haulage of materials for roadwork is carried out by the urban council by means of petrol lorries and steam tractors. One tractor with two trailers, by Aveling & Porter, purchased last year, has easily earned its share of loan repayment. Further sections of private street improvement works will be carried out, together with a further length of Tarmac and a trial length of other surfacing material. The works will also include ragstone tar-paving of paths, 2,000 super yds. The Local Government Board's sanction has been received, and the land having been purchased the following undertakings will be put in hand during the first week of February—viz.: Additional allotments (40 acres); public walks and pleasure grounds; new depot; and 150 cottages and roads and sewers in connection therewith. The loans for this part of the work, totalling over £56,000, have been successfully negotiated at 4 per cent. The new surface-water drainage scheme at World's End, with automatic sluice and outfall (estimated cost £28,400) will be probably put in hand, in order that no flooding may occur in the new housing areas.

Tipperary (Mr. E. A. HACKETT, M.INST.C.E., county surveyor).—The total mileage of roads repaired by the council is 1,500 miles. Practically no new roads are made or in contemplation. About 48 miles of main roads are steam rolled annually by sheeting all over travelling way 3 in. thick and consolidating. A variety of small works are carried out—viz.: Footpaths, culverts, drains, and occasionally small bridges. The work for the ensuing year will be of the same type.

Tiverton (Mr. J. SIDDALLS, borough surveyor). The council having, for the past twenty years, been engaged in carrying out improvements in all departments of municipal work—viz., purchase of and remodelling the gas works, installation of the most modern equipment of sewage disposal works, additional water supply works, concrete reservoirs, new schools, and street widening, the housing scheme, including eighteen working-class dwellings being the last to be completed, there remains comparatively little to be done of urgent importance, and the fact that 40 per cent of the council's employees in the streets and highways department have volunteered for service will naturally tend to a slowing down for a time of municipal activities. The council, however, are not standing still. The work of inspection and improvement of the housing conditions is steadily progressing. A new scheme for water supply to the village of Bolham is about to be commenced, and the question of refuse disposal and the purchase of a light traction engine are under consideration.

Todmorden (Mr. J. A. HEAP, borough surveyor and waterworks engineer). In addition to the ordinary routine work, the following works will be carried out during 1914-15 viz., storm-water tanks at sewage disposal works; public and private street improvements; sewerage works; coating main roads with tar-macadam; bowling greens and tennis courts at Centre Vale Park; hockey fields and tennis courts at secondary school.

Tring (Mr. S. S. GETTINGS, Assoc.M.Inst.C.E., surveyor to the urban district council).—The council have received the sanction of the Local Government Board for a loan of £1,000 for kerbing, channelling and tar-paving footpaths for parts of Wingrave-road, Grove-road, Station-road and Park-road, and also for £340 for relaying foul-water sewer in the New Mill district. These works will probably be put in hand early in the year. The council are spending about £100 annually on tar-painting roadways with refined tar, the work being executed departmentally. A new sewer in Bunstrux-hill has been laid during the past year to drain a further twelve dwelling-houses which have been erected for letting to the working classes. The council now possess fifty-six houses of this class, which are used entirely for letting to tenants of houses which are considered unfit for habitation. A considerable amount of work has been put on to the surveyor's department owing to the close proximity of the camp of the 21st Division at Halton Park, and the billeting of about 3,000 troops in the town. Temporary baths have been fitted into an existing building, including twenty-four galvanised-iron slipper baths, which are supplied with hot and cold water. The council have given the War Office permission to erect two additional pavilions at the isolation hospital, which, it is expected, will be put in hand shortly. A large amount of disinfection of clothing has been done for the military authorities. Owing to the War Office taking all the schools in the town for hospitals for ordinary illnesses, several public buildings have had to be altered so as to adapt them for the use of temporary schools, and sanitary accommodation erected.

Ulverston (Mr. C. TELFORD HAGUE, surveyor to the urban district council).—The widening and improvement of Priory-road, contemplated last year, is now in hand, and will be completed early in the present year. A loan of £5,612 for works of sewerage and sewage disposal has been granted. The widening and improvement of several principal roads are under consideration, and a further extension of tar-macadam and tar-spraying is contemplated. A number of private streets are scheduled for making up under the Private Street Works Act.

Ventnor, Isle of Wight (Mr. H. H. OAKE, surveyor to the urban district council). A great deal depends on the progress of the war as to what municipal works are carried out in Ventnor during 1915. For many years past practically 50 per cent of the visitors to this town were Germans; in fact, it was no uncommon thing to find during the summer months the chief hotels in the town with fifty or sixty visitors in each, and hardly an Englishman among them. For this reason Ventnor has been more severely hit by the war than any other seaside town on the whole coast. On the outbreak of war in August last, the town of Ventnor responded most nobly to the call "For King and Country," nearly every eligible man joining the colours. Several contracts were about to be let, but these were immediately cancelled. It is almost too much to hope that the war will be finished in time to allow the country to resume normal conditions before the end of next summer, in which case it is not anticipated that anything but ordinary routine work will be proceeded with. The cemetery extension, which has now been in hand for some years, will no doubt be completed, and possibly some of the underground conveniences which were under consideration will be constructed.

Wadebridge (Mr. ROBERT W. BURR, surveyor to the urban district council).—The council intend completing the raising and widening of the Egloshayle-road, and constructing a promenade along the bank of the river. It is proposed to lay out bowling greens in the public park. Various street improvements have been carried out, and others are projected. It is also intended to make extended use of tar-macadam and tar-spraying, for which the council are about to purchase the necessary plant. The public convenience at the Bridge End is completed.

Wakefield (Mr. J. P. WAKEFORD, M.INST.C.E., city engineer and surveyor). — County borough powers come into operation on April 1st, and it is anticipated that the following works in progress or projected will be completed during the financial year 1915-16. The drainage scheme for the western half of Sandal (£18,000), the chief for the coupling up of the existing sewage work at Agbrigg to the main sewage outfall works at Calder Vale; and a scheme for the remodelling of the sewers in the Agbrigg and Belle Vue districts (£4,800). Oxidation experiments for the purification of sewage have been in progress for the last four months, with most satisfactory results. Some time, however, must necessarily elapse before arriving at the best method of working the process. A scheme for extensions and additions to the infectious diseases hospital, including an addition of twenty-four beds, new laundry block, discharge block and lodge, and additions to the administrative block (£14,000), has been submitted to and approved of by the Local Government Board. The question of a tuberculosis sanatorium is being considered. The repaving of several streets with granite setts, for which a loan of £14,000 was sanctioned by the Local Government Board, is proceeding steadily. The widening and improvement of various roads and streets is at present in hand, or will be undertaken during the year—viz.: Castle-road, sewering and part widening (£2,300). Sugar-mine, sewering and widening to 40 ft. (£4,400), and the improvement at the junction of Denby Dale-road and Bigg-road (£150). The relaying of part of the Denby Dale-road sewer (£1,200) has been completed, and the resewering of Vicarage-street (£2,450), and the relaying of a portion of the main sewer at Belle Isle (£1,200), will be undertaken in the early spring. The scheme for the demolition of an insanitary area in Westgate, known as Spawforth and Tidswells yards, and the construction of a new street 40 ft. wide between Back-lane and Westgate, will in all probability be carried out. Private street works have been completed in the past year to the value of £1,500. Public conveniences are being provided at important points within the city, one for gentlemen having been already completed, and one for ladies and gentlemen will shortly be ready for use. Extensions are being carried out at the Cattle Market

(£800), and a scheme has been prepared for the covering in of part of the public market and the provision of market sheds and stores (£2,800). The building by-laws have been revised and are at present in the hands of the Local Government Board. Plans have been approved, and the loan sanctioned by the Local Government Board, for 108 houses for the working classes at Alvechurch and Bells Yew (£18,000), the work being temporarily held up by reason of the recent advances in the price of materials. The Works Committee have adopted the suggestion of the city engineer to abandon the use of water-cooled manholes, and to substitute ventilators in the covering of all their sanitary pressure sewers with watertight joints.

Wallingford (Mr. WM. HENEY-BONE, borough and building surveyor).—Various private street works are contemplated, also surface draining, while main roads and other roads will be re-surfaced. The council also contemplate having some Tarmac and artificial stone flag footways laid. The completion of a fencing job for twelve workmen's dwellings is to be carried on with as a new lodge and entrance gates and fencing to the walks of a Horse park, recently presented to the borough.

Wantage (Mr. JOHN W. HARRIS, M.I.M. AND C.E., engineer and surveyor to the rural district council). In addition to ordinary routine work the erection of six workmen's dwellings, together with the erection of fencing, extension of sewers and construction of house drains in the village of Letcombe Regis will be completed during the year. A water supply scheme for the village of Letcombe Regis is now being prepared, and will shortly be submitted to the Local Government Board with a view to sanction of a loan for carrying out the work. The council have under consideration schemes for the extension of sewerage and sewage disposal works in the parishes of Ardington and East Lockinge, at a cost of £1,200.

Ware (Mr. FOX HILL, surveyor to the urban district council). Beyond the usual works, nothing of much importance is projected. A scheme for the proposed widening of Star-street is under consideration, and will be carried out during the coming year, and a scheme for the improvement of the water supply, in the shape of an increased pressure in the mains that supply the higher parts of the district, is still under consideration.

Warrington (Mr. A. M. KER ASSOC.M.INST.C.E., borough engineer and surveyor). Powers have already been obtained for widening Butter-market-street from 22 ft. to 60 ft., and this widening will be proceeded with as the new buildings are finished and the old ones demolished. The second quadrant of the Market Gate-circus will then be completed. Street works, at a cost of £7,500, will be carried out. Application will be made to the Local Government Board for sanction to borrow about £12,000 for private street works. The small-pox hospital is to be permanently appropriated for a sanatorium, and extended at a cost of £5,000, and a new small-pox hospital erected on another site. The completion of the rearrangement of the stalls in the fish market is to be proceeded with, and an underground lavatory is to be placed beneath the market. Application is being made to Parliament for the widening of a portion of Sankey-street, and negotiations are proceeding for the acquisition of the necessary property. Tramway shelters are to be provided at the termini of the various routes. A further extension of slipper baths at the public baths is contemplated, as well as the provision of a swimming bath at the Evelyn-street council school. Warrington Bridge is now nearing completion, and the works of paving the bridge and widening of the streets converging upon it are in hand, and will, it is expected, be completed early in the year.

Wath-upon-Dearne (Mr. J. H. DREW, M.I.M. AND CO.E., M.R.SAN.I., engineer and surveyor and waterworks engineer to the urban district council).—The new waterworks extensions, which have recently been completed at a cost of £12,000, were opened on January 1, 1915. The extensions and remodelling of the sewage disposal works is proceeding, and a contract has been entered into. When completed the cost will approximate to £14,000. Land has been purchased for several important road widening schemes, and these will be carried into effect at a cost of several thousand pounds. A number of streets will be made up under the provisions of the Private Street Works Act, 1892. A housing scheme has been under consideration, and plans have been placed before the council for the erection of 252 workmen's dwellings, but, owing to the war and prices of building materials, the scheme will probably remain in abeyance for some time to come. The joint light railway scheme, promoted by the urban district councils of Wath-upon-Dearne, Bolton-upon-Dearne, Wombwell, and Thurnscoe, has been approved by the Light Railway Commissioners after an exhaustive inquiry and much opposition. The estimated cost is £151,891, and it is probable that the construction will be commenced during the year. The Wath-upon-Dearne council, in conjunction with the urban districts of Bolton-upon-Dearne and Thurnscoe, are applying to the Board of Trade for an Electric Lighting Order. The estimated cost of the scheme is £46,000. The Wath and Bolton Joint Gas Board contemplate carrying out extensive improvements and additions to their undertaking, and the cost will probably be about £30,000. Under normal conditions the year would have been an extremely busy and important one in the annals of the district, but the European crisis may somewhat limit the works which will be undertaken.

Wealdstone (Mr. HERBERT WALKER, F.C.S., engineer [illegible]). The past year has been a very busy one, the council having been constructing by direct labour an extension at their sewage outfall works for the treatment of the sewage from an adjoining area. The extension consists of a detritus and sedimentation tank with capacities of 136,000 gallons, and a storm-water tank with a capacity of 140,000 gallons. Each are provided with sludge-raising apparatus which gravitates to four sludge lagoons, 40 ft. by 12 in., these being covered over with a roof. There are six circular filter-beds, 65 ft. in diameter and 5 ft. deep, constructed on concrete floors, with aërating tiles and walls built up of coarse clinker, and graded clinker as filtering media, supplied from two automatic feed-chambers to the rotating distributors, the humus being collected into chambers, and the final effluent discharged over land and earth channels for aërating before being finally discharged into the Wealdstone Brook. The works now consist of tanks with a total capacity of 1,000,000 gallons, three 80-ft. circular filter-beds, and sixteen 65-ft. circular filter-beds. The council erected three years ago a small garbage destructor in connection with the disposal of house refuse, and this has proved of such service that another has just been completed on the same principle. The council propose to construct a concrete culvert over the Wealdstone Brook for a length of 500 yds. Plans and estimates are in course of preparation for an underground sanitary convenience. Two strong rooms are now in course of erection adjoining the council offices. As regards private street improvements, three streets have just been completed, and another street is to be put in hand. The council now have eleven grass tennis courts, two hard tennis courts have been constructed, and these have been so much appreciated that two others are contemplated. About 7 miles of roadway were tar-painted last summer, and these will be treated again this summer.

Wednesbury (Mr. E. MARTIN SCOTT, borough engineer and surveyor). — Supplementary to the ordinary routine work of the borough, several street improvements are contemplated — viz., widening and rebuilding Wednesbury bridge over the river Tame, widening the corner of Oakeswell End and Brunswick Park-road, completion of street improvements in the Shambles, abutting on the Market-place, and other minor street improvements and footway pavings. Private street improvement works will be undertaken by the corporation under the Private Street Works Act, 1892. The council have under consideration a housing scheme for the erection of suitable workmen's dwellings for

the district. The new County Metallurgical Institute has been recently opened, and is now in full swing.

West Bromwich (Mr. ALBERT D. GREATOREX, M.INST.C.E., M.S.A., borough engineer and surveyor).—Among the works projected for 1915 by the town council are the widening of Wednesbury Bridge and approaches, jointly between the Staffordshire County Council, the Wednesbury Corporation, and the council; extensions to infectious diseases hospital, and street improvements and road widenings. The housing question is under consideration, and it is probable that a number of artisans' dwellings will be erected. The Education Committee have invited tenders for the erection of two schools and a school clinic. Plans are being prepared for enlarging the sewage works at an estimated cost of £25,000. The general routine work will include the continuation of improving road surfaces with tar-macadam.

Whitley and Monkseaton (Mr. A. J. ROUSELL, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council).—The following works are contemplated, and will probably be put in hand during the coming year—viz.: New sewerage scheme, public shelter and gardens on the Promenade, Rockcliffe end; construction of new road from Whitley-road to Monkseaton new station; Provisional Order for purchase of land for town hall and public offices; various street improvements; and a town planning scheme. A good deal of the negotiation in connection with the latter has been concluded. Making up of a considerable length of private streets will be proceeded with, as well as the extension of the council's housing scheme. The purchase of the links and foreshore, and the promotion of a Bill in Parliament dealing with the matter are also contemplated.

Whitstable (Mr. FRANK LAURENS, surveyor to the urban district council).—There are several important public works to be undertaken during the coming year. The council have acquired a piece of land from the Admiralty on the west side of the town for the purpose of providing a recreation ground on the sea front. A bandstand, public conveniences, and wind shelters are to be erected, and the whole of the ground enclosed with an ornamental iron fence, at a cost of about £5,000. It is also proposed to construct a bathing pool on the west beach, at a cost of about £250. At Tankerton several new streets are to be made up under the Private Street Works Act, 1892, and the sea wall is to be extended to the urban boundary during the coming year. The new station at Westmeads, on the Kent Coast main line (South Eastern and Chatham Railways), which has cost about £35,000, was opened for traffic on January 1, 1915, and will probably open up a large area for building purposes, as soon as circumstances will again permit building under normal conditions. The drainage of the cliff slopes is to be taken in hand with a view of providing work for the unemployed should such necessity arise. The drainage scheme, which cost nearly £40,000, is nearing completion.

Widnes (Mr. JOHN S. SINCLAIR, ASSOC.M.INST.C.E., borough surveyor).—Owing to the shortage of labour, in consequence of the war, several works will be delayed until the labour market returns to its normal condition. Fair progress has been made with the Deacon-road improvement scheme of widening the road and filling up the quarry; 10,030 loads have been deposited during the last eight months, and a further 4,000 load are required to bring up the road to the formation level. The tender of the Sterling Refuse Destructor Company has been accepted for a three-cell back feed destructor, including chimney 100 ft. high, tar-macadam plant, stone breaker, mortar mill, and electric lighting, at an estimated cost of £6,900, in hiding other works to be done by the corporation. A sanatorium is to be erected adjoining the isolation hospital to provide accommodation for fifteen males and thirteen females, at an estimated cost, including land, of £3,500. A public lavatory for males and females, for the market, is to be provided, at an estimated cost of £300. Other public conveniences in other parts of the town may be proceeded with. The conversion of privies into water-closets is rapidly proceeding; 1,360 were completed last year, and it is contemplated to alter about 600 privies this year. The other works contemplated are the sewering of several streets and passages in the Warrington-road district, at an estimated cost of £1,100, and private street improvement works—streets and passages—at an estimated cost of £6,000.

Wigan (Mr. A. T. GOOSEMAN, borough engineer and surveyor).—Baths.—The extensions to the baths have been commenced, and will be completed early in the year. Contracts amounting to £4,053 have been let for the scheme, which includes extending the pond, and erecting a reinforced-concrete gallery at the end of the baths, which will be stepped, and will have seating accommodation for 160 persons. New entrances, dressing-rooms and wash-baths will be provided. The slipper baths will be remodelled, and the floors and roofs reconstructed in reinforced concrete. New boilers and calorifiers will be installed. Tramways.—The laying of a double line of tramway in Wallgate in place of the single line has just been completed, and the carriageway has been reconstructed in granite setts. Application is being made to the Board of Trade for a loan for the construction of several sight loops. Parts of the existing tracks will be reconstructed. Greenhouses at Park.—New greenhouses at the park are being constructed by contract, at a cost of £458, and a new boiler and heating apparatus installed at a cost of £157. Housing.—A Local Government Board inquiry has been held for sanction to borrow £22,700 for the erection of 138 workmen's dwellings, and the streets in connection with same. This scheme will be commenced during the year. Conversions.—The conversion of 10,000 privies and pails into the water-carriage system will be proceeded with, at an estimated cost of £40,000. Sewage Disposal Scheme.—The Local Government Board have approved of the sewage disposal scheme prepared by the borough engineer, the estimated cost of which is £50,638, and it will be commenced immediately. Road Construction.—A number of roads will be reconstructed in granite setts on concrete and tar-macadam, at an estimated cost of £20,000. Private street improvement works will proceed as usual. A scheme is being prepared for the laying out and construction of a new road, 72 ft. wide, from Wigan-lane to Whelley, which includes the construction of a viaduct across the valley of the river Douglas. Sewerage.—Two large main sewers from the Poolstock and Worsley Mesnes districts, owing to mining subsidence, will have to be reconstructed. Schools.—A girls' high school, to accommodate 275 scholars, is in course of erection, at a cost of £10,690, and a new elementary school to accommodate 350 scholars is almost complete, the cost being £5,302.

Windermere (Mr. C. T. HINE, surveyor to the urban district council).—Important main road improvements (estimated to cost £1,199, half of which will be contributed by the Road Board) will be proceeded with. Three private streets are to be made up. Progress will be made with the sewerage and sewage disposal works, which will be in working order by the end of 1915. In connection with these works, plans have been prepared for the erection of a workman's cottage, which will be erected during the year. It is probable that the work of providing roads with bituminous-bound macadam surfaces will be extended. Plans have been prepared for a cart-shed and additions to a public building. These works may be carried out

Wolverhampton (Mr. GEORGE GIBLIN, M.INST.C.E., borough engineer and surveyor).—A long-felt want in Wolverhampton is one of the proposed undertakings, viz., the erection of a swimming bath for the sole use of ladies, as it is felt that the present arrangements of allotting certain days to the enjoyment of swimming at the existing baths does not meet the ever-increasing demand of those ex. The borough engineer has the

[illegible] for this purpose, and this has been granted by them. Housing accommodation for the council's firemen will be solved by the erection of ten cottages, for which the Local Government Board has been asked [illegible] for this work, and the site chosen for the erection [illegible] roads in the borough by making up and constructing a number of new streets. Plans are also being prepared for the [illegible] version of a mile of single track into double track is at present in hand, and the work will be completed [illegible]

Workington (Mr. H. B. WILLIAMS, borough and [illegible]). [illegible] public park, construction of an open-[illegible] the intake of the water supply from [illegible] construction of existing water-bound roads with tar-macadam. Private street improve-[illegible] bordering on Crummock Lake, near the intake works, will take place during the forthcoming spring and summer months. Other works of minor importance [illegible]

Worcester (Mr. T. [illegible], Assoc.M.Inst.C.E., city engineer, waterworks engineer and surveyor).—During the year 1915 the corporation proposed to [illegible] at the waterworks by the addition of two boilers and the provision of a new coaling place at a cost of about £1,000.

Worthing (Mr. FRANK [illegible], Assoc.M.Inst.C.E., borough engineer and surveyor).—The following are under consideration by this council to be carried out next year—viz.: Additional pumping station, and outfall pipe at the sewage works, at a cost of £6,000 (partly on loan); surface-water drainage, £1,200 (in hand); and the erection of cottages for working classes. A considerable number of streets will be made up under the Private Street Works Act, 1892, and important street widenings, sea defence works, extension of water mains and sewers, and other works will be put in hand.

Wrexham (Mr. J. ENGLAND, borough engineer).—The extension of the surface-water drainage, at a cost of £1,300, is to be undertaken. The erection of forty-four houses for the working classes, at a cost, including street works, of £9,200, is part of a scheme which, when completed, will comprise the erection of 122 houses, land for which has already been provisionally purchased at a cost of £1,600, the area being 9¼ acres. The laying out of the Parkau is proceeding, the bandstand and bowling greens having been opened during the summer, and at the present time four grass tennis courts are being laid down, and arrangements have been made for the construction of two "hard" courts. The tar-macadamising of several lengths of main and secondary roads is contemplated, and application is being made to the Road Board for grants towards the cost of same. The making good of several private streets will be taken in hand, in addition to those at present being completed.

Wortley (Mr. F. THURLBY, sanitary engineer and surveyor to the rural district council).—In addition to the ordinary routine work it is proposed to enlarge the sewage works at Chapeltown, Ecclesfield and Tinsley. On receiving the sanction of the Local Government Board to a loan, the sewering and construction of sewage works at Wharncliffe Side Village will be carried out. A scheme for disposal of the sewage at the hamlet of Charlton Brook, which has been approved by the council, will be carried out. Application will be made to the Local Government Board to obtain a loan to sewer Lotley. About 600 yds. of 9-in. sewer will be laid, and four streets made up under the Public Street Works Act, 1892, in Ecclesfield parish, and application will be made to the Local Government Board to adopt the Public Street Works Act, 1892, for several more streets, and for sanction to prepare a town planning scheme.

York (Mr. F. W. SPURR, city engineer).—The following works will be [illegible] Sewage disposal works, Naburn, and storm-water tanks and electrically driven pumping plant at Fulford; Glen Gardens and Playing Fields, Heworth; piling and laying out of river bank, near Lendal Bridge; electric sub-station, Lendal Bridge; reconstruction of roads (Clifton and Malton road) in tar-macadam on concrete; tramway passenger shelter, Holgate. Contracts have been let for the following, and the works will be commenced shortly—viz.: Tramway extensions, Hull-road and Haxby-road; new street, 400 yds. [illegible] works-lane; new main sewers at Heworth; new weights and measures offices, police quarters and recreation room; twenty-eight cottages for tramway employees at Fulford. Plans for the following are in preparation, and it is probable that several of the works will be put in hand during the year—viz.: Two hundred and forty-eight cottages and laying out of estate at Heworth; extensions to fever hospital; Butcher-terrace extension; footbridge, Burton Stone-lane railway crossing; reconstruction of several roads in tar-macadam on concrete; public conveniences; extensions to car sheds; several streets under the Private Street Works Act, 1892. Three large town [illegible]

Yorkshire, West Riding (Mr. F. G. CARPENTER, county surveyor).—The county council have approved of an estimated expenditure of £238,380 in respect of the maintenance and repair of the main roads in the Riding. Among the special works proposed to be taken in hand are surface-tarring on main roads (£20,000); reconstruction of Stock Bridge (£14,700); Carlton Bridge (£16,200); reconstruction of Kilnhurst Bridge (£9,575); diversion of the Keighley and Kendal main road at Clapham; reconstruction of the Tadcaster and Hob Moor main road, between York and Tadcaster; and the reconstruction of a further length of the Wakefield and Austerlands main road at Lepton.

Ystradgynlais (Mr. T. WATKINS, surveyor to the rural district council).—Brynmorgan Bridge, over the river Twrch, in ferro-concrete (Hennebique), has been commenced, and is expected to be ready for traffic about April. Ainir Bridge, over the river Tawe—a timber structure—will be rebuilt in ferro-concrete, and Deriven-road, leading up to it, will be widened and improved. It is proposed to construct a new road between Abercrave and Colbren, two important colliery centres in the district. The sewering of the district, which is a very scattered one, will take about two years to complete. It will involve an outlay of over £30,000, and is being carried out under the direction of Mr. Gerald Swayne, of Victoria-street, Westminster, the engineer for the scheme. Sixty council houses—twenty-two at Ystradgynlais, eighteen at Abercrave, and twenty at Colbren—are in course of erection, and will be ready for occupation in a few months. The council are applying for a Provisional Order to light the district, and have agreed to purchase the undertaking of the Glantawe Electric Supply Company at £17,000. The works will be enlarged when taken over by the council. It is intended to increase the water supply by turning on additional springs, in order to supply Ystradgynlais Higher [illegible]

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liberal Counties*.

HIGHWAY DEVELOPMENT IN AUSTRALIA.

NATURAL FEATURES AND EXISTING ROADS IN EAST GIPPSLAND, VICTORIA.

The Country Roads Board of Victoria, Australia, recently made a study of the conditions in Gippsland, with a view to the development of that promising area by means of road improvement and construction; and through the courtesy of Mr. W. Calder, M.INST.C.E., chairman of the board, we have been

View from Riggalls at Glenfalloch, Shire of Maffra.

able to keep our readers in touch with the work of that body with respect to this region, as well as in matters relating to their activities generally. A sketch map of South Gippsland was reproduced in

The Mitchell River, Shire of Avon.

our issue of January 2, 1914, and a similar map of East Gippsland in the issue of February 20, 1914.

The accompanying photographs, which Mr. Calder has kindly sent us, give an excellent idea of the

Gravel Road, Shire of Avon.

natural features of the country, and the nature of the problems that confront the highway engineer. No. 1 is a view from Riggalls at Glenfalloch and is suggestive of interesting road designing work, in a region of considerable promise from the farming point of view. No. 2, the Mitchell River, in the neighbouring Shire of Avon, suggests problems in bridge location and in the tracing of hillside roads. No. 3 is a stretch of gravel road between Sale and

Graded Road along Banks of McAlister River, Maffra Shire.

Stratford, not far from the coast, and No. 4 is a graded road along the banks of the McAlister River.

A gradient of 1 in 5½ is shown in No. 5, on the Bullumwall road, near Boggy Creek. To the eye of

A Gradient of 1 in 5½, Shire of Bairnsdall.

the experienced road engineer there is in this picture something suggestive of natural conditions which render primitive roads very difficult to traverse, but are favourable to the making of especially good roads when engineering skill is brought to bear on the problem.

Whaley Bridge Joint Sewerage Scheme.—During the past year the joint sewerage scheme of the Yeardsley-cum-Whaley Urban District, Chapel-en-le-Frith Rural District, Disley Rural District, and Macclesfield Rural District has been completed at a cost of nearly £26,000. The scheme drains the valleys of the Black Brook and river Goyt, the sewage being treated at disposal works situated at Furness Vale. The engineers were Messrs. Beards & Pennington, Chapel-en-le-Frith.

South London Housing Scheme. A revised scheme for the erection of dwellings on the first section of the Tabard street area, Southwark, was submitted to the London County Council on Tuesday by the Housing of the Working Classes Committee. The report stated that, owing mainly to the increase in the rates of wages and in the cost of building materials, the former scheme would have shown a capital deficit of £8,280. It was therefore considered necessary to prepare a new scheme, and the present proposal was that, upon an area smaller than was originally proposed, 120 tenements should be erected, containing 310 rooms compared with 285 rooms in the dwellings comprised in the former scheme. The estimated expenditure on capital account was £28,582. The Finance Committee reported that, with interest at 4½ per cent on this outlay, an annual deficiency of £206 was shown.

The Legal Precedents of 1914 in Relation to Municipal Engineering.

By J. E. REGISTER CONDER, a Solicitor of the Supreme Court.

Among the subjects [illegible] dealing on matters within the scope of this journal, highways [illegible] rank first in point of numbers. [illegible] a perusal [illegible] which the reports of the decisions [illegible] with the property [illegible] such as for example [illegible] accidents, [illegible] works, extraordinary traffic, dedication and repairing [illegible] mention only a few.

As usual, several cases have involved the construction or interpretation of some statute or provision. Among the Acts that [illegible] are to be found the Highway Act, 1835 (sec. 23), the Railway Clauses Consolidation Act, 1845, the Waterworks Clauses Act, 1847 (sec. 53), the Metropolis Management Act, 1862, the Public Health Act, 1875 (secs. 150 and 257), the Rivers Pollution Prevention Act, 1876, the Baths and Washhouses Acts, 1846 and 1878, the Highways and Locomotives (Amendment) Act, 1878 (sec. 20), the Electric Lighting Act, 1882, the Bankruptcy Act, 1883, the Housing of the Working Classes Act, 1890, the Private Street Works Act, 1892, the Public Authorities Protection Act, 1893, the Thames Conservancy Act, 1894, the London Building Act, 1894 (sec. 22), the Locomotives Act, 1898, the Housing and Town Planning Act, 1909, and the London County Council (Tramways and Improvements) Act, 1913.

Among the [illegible] Bacup, Barnsley, Bessels, Bradford, Bristol, Burnley, Croydon, Crouch End, Folkestone, Hadham, Knutsford, Ledbury, Linthwaite, Llangollen, Long Eaton, Newcastle-on-Tyne, South Benfleet, Tottenham, Walton-on-Thames, Wandsworth, and Worcester.

The cases comprise [illegible] decisions of the House of Lords, twelve of the Court of Appeal, seven of the Chancery Division, seven of the King's Bench Division, and one of a county court.

Ancient Lights.

A decision [illegible] important point in connection with this subject was decided in *Bailey & Son, Limited*, v. *Holborn & Frascati, Limited* (vol. xlv., p. 484). The plaintiff had for [illegible] years enjoyed good and sufficient light to two houses. In consideration of a money payment, the [illegible] agreed to erect [illegible] to the adjoining premises the effect of which would diminish that light to a certain extent. The defendants subsequently made alterations in another adjoining building, which further diminished the plaintiffs' light. On behalf of the defendants it was contended [illegible] by implication from the prior alterations, had abandoned their easement. But Mr. Justice Sargant held that there had been no such abandonment. He did not consider the case one for an injunction, and awarded the plaintiffs £50 damages.

Baths.

The question [illegible] whether a kinematograph exhibition is "healthful recreation" was raised in *Pierce and Others* v. *Stoke Council*. The Attorney-General applied for an interim injunction to restrain the corporation from permitting the Hoxton Baths to be used for kinematograph shows. But Mr. Justice Eve held that such entertainments were "healthful recreation or exercise" within the meaning of sec. 5 of the Baths and Washhouses Act, 1878, and refused the application. A further question raised was whether the incidental music was a contravention of sec. 2 of the Baths and Wash-houses Act, 1896 (which requires a licence to be obtained for music or dancing at public baths); but this point was not decided.

Building Line.

A point of considerable importance as to the building line of the Euston-road was decided in *Cadogan Estates* v. *London County Council* (vol. xlvi., p. 56). By an Act of 1756 the building line was fixed at 50 ft., notwithstanding which certain buildings were erected only 11 ft. back from the road. The Act was subsequently repealed by the Metropolis Management Act, 1862, which provided that, where the general line of building did not exceed 50 ft. from the highway, no building should be erected beyond that line without the consent of the Metropolitan Board of Works. In 1907 the council authorised the construction of buildings in the road which had been built to the 11-ft. line. In 1909 the architect of the council purported to define the general line of buildings under sec. 22 of the London Building Act, 1894, as 50 ft.; but it was held by the Court of Appeal (overriding the architect's certificate) that the council could not repudiate the line authorised by the board in 1867, and that the owners of premises fronting the road were entitled to build up to that line.

Contract.

Questions [illegible] arising point in connection with a contract for works was involved in *Porter* v. *Tottenham Urban District Council* (vol. xlv., p. 363). The council owned a piece of land adjoining a road, and the plaintiff entered into a contract to build a school on the land, and to complete it within ten months, subject to penalties. The council agreed to give the plaintiff immediate possession of the land, which could only be approached by the road. A landowner named Rowley, however (who had laid out the road), alleged that that part of it which adjoined the council's land had never been dedicated to the public, and threatened plaintiff with proceedings for an injunction in the event of his attempting to use it. The council took proceedings against Rowley, and ultimately the whole road was held to be a public highway (see *Tottenham Urban District Council* v. *Rowley, infra*). Meanwhile, however, the work on the school was suspended for nine or ten weeks. It was held that the council were not liable for the delay, inasmuch as their obligation to give possession was limited to their own acts and ability only, and did not extend to the acts of third parties.

In *[illegible] Trustee* v. *[illegible]* (vol. xlvi., p. 334) the bankrupts, a firm of builders, had contracted to do certain work for the corporation of Burnley. The contract contained a forfeiture clause and a clause appointing the engineer arbitrator in any dispute between the bankrupts and the corporation. The corporation having proceeded under the forfeiture clause, the Trustee in the bankruptcy applied in the County Court for leave to examine the engineer, under sec. 27 of the Bankruptcy Act, 1883, as to various matters connected with the contract. The County Court Judge refused the application on the ground that the engineer could not give any information that was not already in the possession of the bankrupts. The Divisional Court overruled this decision, allowed the Trustee's appeal, and made the order asked for.

Electric Supply.

In *[illegible] Electric Supply Company* v. *[illegible] Urban District Council* (vol. xlvi., p. 718) the council were authorised by a special Act to supply electricity. Up to January 1, 1912, they charged all consumers of electricity according to two scales—one for light and another for power. In September, 1911, they gave notice of their intention to increase the charges for power to those consumers who required power only, or power and partial lighting only. It was held by the Court of Appeal that the council had failed to discharge the onus of proof that this increase was justified under secs. 19 and 20 of the Electric Lighting Act, 1882, which prohibit undue preference.

Highways.

Accidents.

In the case of Mr. Justice Scrutton, in *Hurlock* v. *London Electric Railway Company and Another* (vol. xlv., p. 232) was reversed by the Court of Appeal (vol. xlv., p. 592). By an agreement between the company and the other defendant, the latter agreed to build and take a ninety-nine years' lease of a superstructure over the company's tube station at Cranbourn-street. During the progress of the work a piece of wood fell on the plaintiff's head. Mr. Justice Scrutton held that the company had a duty to safeguard the public, and could not rid themselves of that duty by delegating it to an independent contractor. But the Court

of Appeal held that the company, being merely the lessees of the building, were not liable.

In *Papworth* v. *Battersea Borough Council*, the plaintiff, while riding a bicycle, was thrown by reason of a defective gully. The council were both the highway authority and the sewer authority, and Mr. Justice Horridge held that they were liable in the latter capacity, and gave judgment for the plaintiff for £1,961, the amount awarded by the jury. The Court of Appeal ordered a new trial on the ground that the conduct of the trial was unsatisfactory.

(b) DEDICATION.

The House of Lords affirmed the decision of the Court of Appeal cited in vol. xliii., p. 830, in *Tottenham Urban District Council* v. *Rowley* (vol. xlv., p. 254). The defendant having laid out a new street in accordance with an approved plan, made it up for only half its width, but it was used in its entirety without interruption by the public from 1908. The council were the owners of land abutting on the unmade half of the street, and claimed to be entitled to access to the street from their land. For this purpose they made an opening in their fence. The defendant blocked up the opening, alleging that the unmade half of the street had never been dedicated and was private. But it was held that the whole street was a public highway, because the plan showed an intention to dedicate the whole, which intention had been completed by public user. This was the road referred to in *Parker* v. *Tottenham Urban District Council* (*supra*).

(c) EXTRAORDINARY TRAFFIC.

In *Llangollen Urban District Council* v. *Coward & Co.* (vol. xlv., p. 484) the council claimed £48 14s. 1d. for extraordinary traffic expenses. The traffic consisted in the haulage of timber by wagons weighing 30 cwt. to 35 cwt., each carrying a load of 3 or 4 tons, and was continued for a long period of time, two journeys a day being made by each wagon. The main defence was that timber-growing was a recognised industry of the district. But, while accepting this view, the learned County Court Judge held that the traffic was, nevertheless, extraordinary, the case being indistinguishable from *Geirionydd Rural District Council* v. *Green* (72 J.P., 321). A portion of the claim, however, was barred by sec. 12, subsec. (1) (b) of the Locomotives Act, 1898, and after disallowing this, and certain charges for labour, judgment was given for the council for £33 11s. 9d., with costs.

In *Ledbury Rural District Council* v. *Lady Henry Somerset* the council claimed payment of expenses incurred on account of alleged "extraordinary traffic," consisting of the haulage of stone from a quarry. The evidence showed that traction-engine traffic on the road in question had greatly increased since 1911 (the traffic prior to that date having been for the most part of an agricultural character), and that the defendant contributed rather more than half of the increased traffic. Mr. Justice Lush held that stone quarrying was a recognised industry of the locality, and that the traffic was not "extraordinary." Judgment was accordingly given for the defendant.

In *Worsborough Urban District Council* v. *Barnsley British Co-operative Society, Limited* (vol xlv., p. 958) it was held by the Court of Appeal that, in deciding whether there has been extraordinary traffic, it is not material to consider (*a*) the motive of the persons conducting the traffic, (*b*) whether there is or is not an alternative route, or (*c*) whether a road previously used has been rendered impossible to use by the action of the highway authority; but that the Court has simply to look at the phenomena as they occur on the road in question, to see the nature of the road, and to decide whether the traffic is extraordinary.

(d) REPAIR OF BRIDGES.

The decision of Mr. Justice Phillimore in *Attorney-General, at the Relation of the Worcester Corporation* v. *Stourport Near Dudley, Worcestershire, Navigation Company* (vol. xlv., p. 234) was reversed by the Court of Appeal (*Ibid.*, p. 520). The company were bound by their special Act of 1791 to keep the bridges over their canal in "sufficient repair." The Court of Appeal held that this imposed upon the company the obligation to keep the bridges in a state sufficient to bear the traffic which might reasonably be expected to pass along the highways, not (as Mr. Justice Phillimore held) according to a standard fixed once and for all, but according to a standard varying from time to time, sufficient to carry the traffic of the day. This decision establishes an "up-to-date" standard for bridges carrying highways over canals.

A similar decision was arrived at by Mr. Justice Warrington in *Attorney-General* v. *Great Northern Railway Company* (vol. xlv., p. 1,059), with respect to a bridge carrying a highway over the railway at Crouch End, which the railway company were bound to maintain under sec. 46 of the Railway Clauses Act, 1845. It was also held in this case that the company's obligation was not discharged by the Local Government Board regulations permitting them to affix a notice excluding heavy traffic from the bridge.

(e) NUISANCE.

In *Charing Cross, West End and City Electricity Supply Company* v. *London Hydraulic Power Company* (vol. xlvi., p. 56), the plaintiff company laid electric cables in certain streets under the powers of a Provisional Order, and the defendant company, acting under statutory powers, laid hydraulic mains in the same streets. Owing to subsidence of the soil, due to heavy traffic, and not to any negligence on the part of the defendant company, the mains burst, and damaged the plaintiff company's cables. It was held that the defendant company were liable, on the ground that they had for their own profit brought into the streets a dangerous thing—viz., water at high pressure—which by escaping caused a nuisance not authorised by their statutory powers.

(f) ROAD WIDENING.

In *Goodhart* v. *London County Council* (vol. xlvi., p. 204) the council, acting under the London County Council (Tramways and Improvements) Act, 1913, gave notice to the trustees of a chapel to treat with respect to part of the forecourt of the chapel, which was required for widening the road. Sec. 18 of the Act provided that the council should not be entitled to take or interfere with the main structure of any building. Owing to the gradients of the ground, the proposed widening would practically destroy access to the chapel unless extensive alterations were made thereto. It was held by Mr. Justice Joyce that the destruction of access would constitute an interference with the main structure within the meaning of the proviso, and an injunction was granted to restrain the council from entering upon the land or taking proceedings to obtain possession thereof. This decision was affirmed by the Court of Appeal (vol. xlvi., p. 625).

(g) NEW STREET.

In *London County Council* v. *Allen* (vol. xlvi., p. 625) the council gave their sanction to the laying out of a new street upon condition of the landowner entering into a covenant not to build upon a piece of land at the end of the street. He afterwards sold the land to the defendant, who had notice of the covenant. The council were not in possession of or interested in any land for the benefit of which the covenant was entered into, and on this ground it was held by the Court of Appeal that they could not prevent the defendant from building on the land.

(h) PRIVATE STREET WORKS.

Difficulties frequently arise, in connection with the making up of private streets, in determining whether a particular street is repairable by the inhabitants at large. Such questions, of course, can only occur with reference to old streets whose history may be involved in some obscurity.

There are two important decisions of the House of Lords to be noticed in which this subject was dealt with, one affirming and the other reversing the Court of Appeal.

In the latter case, *Grado* v. *Walton-on-Thames District Council* (vol. xlv., p. 403) the decision of the Court of Appeal (vol. xliii., p. 256) was affirmed. This case related to a bridle and foot way which was set out under an Inclosure Award in 1804 for the use of the occupiers of certain allotments. At some time between 1835 and 1864 the way had become a public highway for vehicles, but there had been no formal dedication under sec. 23 of the Highway Act, 1835. It was held that the road was not repairable by the inhabitants at large, and that, consequently, the council were entitled to make it up, under the Private Street Works Act, 1892, at the expense of the frontagers.

But the House reversed the decision of the Court of Appeal (noted in vol. xlv., p. 232) in *Brockman* v. *Folkestone Corporation* (vol. xlv., p. 556). This case was concerned with the Lower Sandgate-road, Folkestone. That road was laid out in 1827 by the then Earl of Radnor, and was used chiefly by occupiers of houses

... the road, but to some extent also by other ... A gate and toll-box were erected at the ... bells being used on horses and vehicles ... The ... paying ... private road ... repaired by the ... The ... to the ... the properties belonging to a single owner. Mr. ... and not a ...

Housing of the Working Classes.

... plied undertaking that the house shall, during the ... plied undertaking is restricted to the tenant himself. ... daughter) was not entitled to damages for injuries ... if a medical officer finds that any building, "although not in itself unfit for human habitation," is detri... other buildings, the local authority may order it to ... not in itself unfit for human habitation."

Public Authorities' Protection.

... ordered by the plaintiff, the man employed by the corporation negligently tipped some of it through the ... one in which the corporation were acting directly in the execution of a public duty, and that consequently they were not protected by the Act, and the action was not barred by the lapse of time.

Sewage Disposal.

In ... *District Council* (vol. xlv., p. 686) it was held that the only parties against whom proceedings can be taken under sec. 4 of the Rivers Pollution Prevention Act, 1876 (which relates to manufacturing pollutions), are ... produces the polluting liquids. The appeal of the council from the decision of the County Court Judge (declaring that they were guilty of an offence under the section) was therefore allowed.

In ... *Council* (vol. xlv., p. 853) two old sewers, not constructed by the council, had been in use for thirty ... and until 1909 they discharged crude ... into the Thames. In that year the council constructed ... a catchpit to intercept solid matter, the effluent from which discharged into the river. It was held that the council "caused or suffered" sewage to flow into the river, within the meaning of ... of the Thames Conservancy Act, 1894.

Town Moor.

In *Walker* v. *Murphy* some important questions relating to the use of the Town Moor at Newcastle-on-Tyne were decided. Under two local Acts of 1774 and 1870 the soil of the moor was vested in the corporation, and the herbage rights were vested in the freemen and widows of freemen. The Act of 1774 provided for certain parts of the moor being set apart for fairs and ... The Act of 1870 placed the moor under the management of a committee of ... and ... wardens, representing the freemen, and authorised that committee and the corporation jointly to appropriate parts of the moor for reviews, shows, and ... held, and granted licences for shows and roundabouts. In 1912 a licence was granted to the ... for the ... and ... declined to join in renewing the licence. The corporation, however, purported to grant a licence, upon which the defendants acted. It was held by the Court of Appeal that the licence granted by the corporation alone was invalid, and an injunction was ... committee.

Water Supply.

In ... (vol. xlv., p. 363) the company's Special Act provided that they should on request supply the owner or ... for domestic purposes, at rents based on the rental value of the premises. It was held by the House of Lords that this provision overrides sec. 53 of the Waterworks Clauses Act, 1847 (which entitles the ... Act. The guardians therefore were not entitled to ... xlvi., p. 92) the council purchased a piece of land forming part of a farm for the purpose of a reser... house buildings free of charge. The defendant, ... former and turned part of the latter into a garage. Mr. Justice Neville held that the obligation to supply the house was discharged, inasmuch as it had ceased to be the house which existed at the date of the covenant, and that, although the obligation to supply the buildings continued, the water so sup... cars.

CITY OF LONDON ENGINEERSHIP.

... of London the following resolution was adopted with respect to the appointment of engineer: "That it be referred to the Officers' and Clerks' Committee, with ... concerned, and to report whether it would not be in the interest of the corporation to eliminate all valuation work from the duties at present attached to the offices of 'Engineer' and 'Surveyor,' and to make new arrangements in regard to such work; and this court do consider and dispose of such report before any steps are taken in connection with filling up the existing vacancy in the office of 'Engineer.'"

The matter will, in the first instance, be considered by the three committees of the public health department.

Problems in Modern Illumination.—This is the subject of a paper which Mr. Valentine H. Mackinney will present at a meeting of the Institute of Sanitary Engineers to be held at Caxton Hall, Westminster, on Wednesday evening next, the 3rd prox. Mr. A. P. I. Cotterell, the president, will take the chair at 8 o'clock.

Chapel-en-le-Frith Sewerage and Water Schemes.—The sewerage scheme for the Chapel-en-le-Frith, Chunky and Fernilee portions of the rural district of Chapel-en-le-Frith has been completed, at a cost of about £40,000. Altogether there is a length of between 6 and 7 miles of main and branch sewers. An additional service reservoir at Dove Holes, containing 1,500,000 gallons, and costing nearly £5,000, has also been completed. This reservoir is intended to augment the water supply to the Chapel-en-le-Frith and Wormhill districts. Many miles of extension have been made to the various trunk water mains and other extensions are contemplated in the near future. The consulting engineers for these works are Messrs. Brady & Partington, Chapel-en-le-Frith.

Billeting Troops on the Inhabitants of Towns and Villages.

By G. BERTRAM HARTFREE, F.S.I., Engineer and Surveyor to the Alton, Hants, Urban District Council

[The notes on Camp Kitchens and the Selection of a Camping Ground which appeared in our issue of the 22nd inst. were announced as the last of the series of articles which Mr. Hartfree has prepared for "The Surveyor" since the outbreak of war, but the following further contribution has since been suggested to the author by a number of appreciative readers, and is presented in the hope that it may prove helpful to municipal engineers called upon to assist in the important work with which it deals.]

The responsible local authority for billeting work is the civil police force, whose duties consist of obtaining particulars of available room, the possible number of soldiers to take up occupation, and arranging for voluntary or compulsory provision for them. In the absence of any data, the military calculate that it is possible for a force of soldiers to be billeted on an area for one week, and obtain all food supplies, in a ratio of two soldiers per inhabitant, the inhabitants providing the whole of the housing accommodation. Where food can be supplied by the military forces, and empty buildings, barns, and so forth are obtainable, it is calculated that close billeting of from five to ten soldiers per inhabitant can be effected; but, of course, in these circumstances almost every available room would be used for sleeping. A convenient ratio for populous places is one man per two inhabitants.

The sanitation in respect to home billeting is controlled by the local sanitary authority, and recent orders recognise the medical officer of health as the responsible person for these matters. Statute law and orders at present appear somewhat indefinite, and a wide gap occurs between the duties of the military, the civil police, and the health officer, and this can be filled by the local surveyor volunteering his services as technical adviser to the military units.

It is to be necessary to define his position the Defence of the Realm Act could be applied by the commanding officer requisitioning his services.

Broadly, billets may be divided under two headings—subsisted and non-subsisted. Under the former the occupier of the house provides bedding, food and full subsistence, but in the latter instance the conditions may be compared with unfurnished lodgings. Between these two classes there is an unlimited variety coming under the heading of partially subsisted billets.

In reference to subsisted billets, there possibly would be little requiring the surveyor's services; but with the remainder there would be more or less demand, according to local and special conditions. The following will illustrate actual cases:—

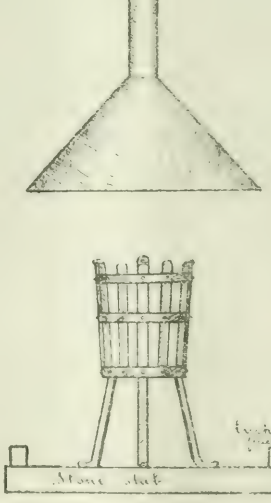
(1) A large hall used for drill purposes is required to house a number of men. In the past the sanitary arrangements were sufficient for the purpose for which the hall was used; cooking arrangements were not required, and special warming was unnecessary. At very short notice cooking arrangements, sanitation and warming is required; the existing system of sewage disposal is entirely water-borne, and there are no arrangements for scavenging earth closets. The military standard for closet accommodation is 10 per cent. In consequence, it was necessary to design a special range of earth-closets in a temporary wooden building erected near the hall. At another spot a temporary cook-house was constructed. From a spot on the roadside waste a special connection was made to a sewer, and portable wash troughs, discharging over a gully leading to this, were provided, and the whole was surrounded by canvas screens. For warming purposes tortoise stoves were provided, resting on stone slabs, with flue pipes insulated in stoneware pipes where passing through or near any woodwork.

(2) An empty dwelling-house, letting at a rental of £50 per annum.—Here the cooking, washing and heating arrangements were all-sufficient; the only problem was closet accommodation. The building was in such a position that any system of scavenging of earth-closets would be objectionable to the occupants of the buildings as well as neighbouring houses, and, in consequence, it was necessary to provide additional water-closets. These were connected to a drain jointed with a plastic composition, so that when billeting was discontinued the whole could easily be removed. The roofs were covered by iron sheets, and the whole screened with canvas.

(3) Empty shop premises, dwelling-rooms and stores.

In the shop and dwelling-rooms there were sufficient arrangements for heating, washing and cooking; but there were insufficient closets, and, of course, there was not a sufficiency at the stores, which were not heated, and were without the other conveniences, making necessary the provision of special kitchens, latrines and stoves.

The provision of these things puts an unusual complexion on the ordinary conditions of landlord and tenant. Under their powers the military are justified in requisitioning the premises, but presumably they cannot insist on the owner of the premises providing the additional works they require. It, however, appears common practice to require the owner to supply these, leaving a problem for the surveyor having decided what is necessary—who is to pay, and at present the only solution is in the fixing of the rent. The Billeting Acts provide that the rent shall be fixed by the officer commanding the unit, the civil police and the owner; in consequence, it may be to the owner's advantage to provide these necessities and to recover in rent. General practice on the part of the military appears to be that the owner should provide everything, charging a covering rent. In fixing this there should be taken into consideration, firstly, a fair rent for the premises made; the special circumstances; secondly, the landlord's outgoings in respect to water, gas, rates, &c.; thirdly, any special expenses to which the landlord has been put. These are based on the weekly rental, but in computing this rental it must be borne in mind that the Army allowance is from 1d. to 3d. per man per day, according to the circumstances, though when leaving the billets there may be justifiable claims by the owner for compensation for damages.



Flue Device with Hood to Collect Coke Fumes.

The emptying of temporary earth-closets presents

[illegible] that has a water-borne system [illegible] sufficient for the purposes of the civil [illegible] and may be used under ordinary [illegible] the exception of the earth system. Under these circumstances it was recommended that the [illegible] and the sanitary inspector, as a voluntary assistant, and not as an officer of the local authority) should arrange with a contractor to empty all [illegible]. The owners of the premises paid the cost [illegible] and the amount [illegible] was reimbursed in the rent charges.

A problem for the health department was the offal from cooking for batches of 200 men; this was settled by finding suitable contractors, who removed it free of charge.

Another problem affects growing villages that have no system of sewage disposal. Here, possibly, previous to the arrival of the military, the need for some [illegible] had never been felt. The sudden influx of large [illegible] has intensified the necessity and [illegible]

SCHEDULE I.—WORKS REQUIRED.

[illegible] Street, Bute Road, Cardiff. Erected [illegible] Brittany House, Yorkstreet, Hafod.

[illegible] quarters for [illegible]

Provide [illegible] per closet

Provide [illegible] for 200 men

Water [illegible] supply

Provide [illegible] each kitchen

Light three rooms [illegible] lighted

Provide [illegible] complete.

Provide [illegible] Drawings [illegible] marked "X."

Observe.—Repair doors, [illegible] windows, repair roofs, [illegible] and repair [illegible] drawing-room and [illegible]

SCHEDULE II.

[illegible] Bute, Royal Calfercias Road, [illegible] Brittany House, Yorkstreet, Hafod.

[illegible]

Weekly [illegible] ascertained rate
Only [illegible] assessed at [illegible] weekly
Estimated weekly value of depreciation ..
Fair [illegible] unfurnished and [illegible] premises

Weekly rentals [illegible] £2 [illegible] £1 [illegible] £2 [illegible] Equalling [illegible] per [illegible] week and [illegible] with [illegible]

SCHEDULE III.

[illegible] Bute, Royal Calfercias Road, [illegible] No. 9 Highstreet, Hafod.

Owners outgoings [illegible]
Less value after use

On the week [illegible]
Proportion of rates ...
Less consumption
Depreciation of property
Fair rental as forced [illegible] requirement of property
Owners' weekly expenses [illegible] earth closets

[illegible] per week by £1 [illegible]

dible scavenging [illegible]. A common [illegible] practice is the use of a street tumbler cart, pails being carried out and emptied into it. A better practice is the provision of tub pails, two to each closet, with suitable vans so arranged that the full tub is removed from the premises in a suitable cart, and a clean tub, previously lime-washed internally, is left in its place. This avoids objectionable slopping found in elementary sewage disposal.

When premises are taken at short notice there may be difficulty in obtaining sufficient stoves for heating, as the influx of a large number of troops absorb the whole of the portable heating arrangements in the locality; in addition to the demand for warming the rooms, there may be a necessity for drying wet clothing. In one case, owing to the absence of more suitable appliances, I arranged for the installation of the familiar brazier, a hood being provided to carry away objectionable fumes.

In completing billeting areas it is advisable—first, to ascertain the total number of men to be provided for and the available room; secondly, to divide the area into suitable divisions for each battalion, these being again sub-divided for companies [illegible] town in the short period of twenty minutes. This [illegible] which bore the names of occupiers of houses, with [illegible] soldier who was to occupy a particular place.

[illegible] quarters, containing offices, orderly-room and guard-room. (2) Medical inspection room with laboratory attached, and, if possible, quarters for orderlies. (3) Quartermaster's stores; these require at least a 500-ft. floor space—more if possible—with shelves for clothes, and separate room for ammunition, and special bread and meat stores. (4) Four rooms for company officers, with small stores attached. (5) (5) Stables for from twenty to thirty horses. (6) Workshops for armourers, pioneers, tailors and shoemakers.

Schedule No. [illegible] requirements to be carried out to an empty building to render it fit for use for billeting; and Nos. 2 and 3 are examples of rent valuation.

HOUSING AT CARDIFF.

CORPORATION SCHEMES.

A housing and town planning conference was held at Cardiff last week, under the auspices of the National Housing and Town Planning Council, the Welsh Housing Association, and the South Wales Garden Cities and Town Planning Association.

In the course of the proceedings a report on housing schemes undertaken by the Cardiff City Council under Part III. of the Housing of the Working Classes Act, 1890, was submitted by the city engineer, Mr. W. Harpur. Under Scheme I., thirty houses, he said, had been erected in Kitchener-road at a cost of £5,280, or £176 per house. The houses were let at 7s. per week, which it was estimated would cover the cost of a sixty years' loan, street works, rates, insurance, water, maintenance, supervision, and collection of rents. The houses were erected upon a site which was the property of the corporation, and a ground rent of £2 per annum was charged upon each house, which represented the repayment of the loan charges and interest on the cost of land.

Under the Splott scheme 144 houses were being erected on property leased from the Marquis of Bute at £30 per acre, which was about half the ground rent usually charged in Cardiff, and in this matter his lordship had met the question of housing very handsomely. The contract price was £22,048, or an average of £153·1 per house, and it was proposed to let the larger and smaller houses at rentals of 6s. 9d. and 6s. 3d. per week respectively, which it was estimated would cover all loan charges and expenses.

Scheme No. 3, under which it was proposed to build thirty-one houses in Kitchener-road, Eldon-street, and Railway-terrace, was in course of preparation, and the details were not yet available. Mr. Harpur stated that what had been aimed at in these [illegible] was to provide suitable houses for [illegible] families, with all the necessary sanitary conveniences, including a bath with hot and cold water supply, at the lowest possible rents on the basis of self-supporting schemes. To enable this to be done it had been necessary to ignore some desirable ideals in the planning, and particularly by the erection of a larger number of houses to the acre than idealists allowed, and by the bringing of the front of the houses on to the street line without providing any forecourt or front garden.

Limerick Surveyors' Salaries.—At a meeting of the Limerick County Council on Saturday a letter from the Local Government Board relative to the proposal of the council to grant increased salaries and allowances to the county surveyors was read. The board intimated that they were advised that the procedure of the council in the matter was irregular, and that the question of granting the increases must be dealt with afresh. It was decided to hold a special meeting to consider the matter.

The Legislation of 1914 in Relation to Municipal Engineering.

A great proportion of the legislation of the past year was necessarily concerned with matters directly or indirectly arising from the war, and the only statutes calling for notice in this column deal with the alteration of boundaries in Scotland, the continuance of various expiring laws, housing and public works loans.

Alteration of Boundaries (Scotland).

The Local Government (Adjustments) (Scotland) Act provides that on any adjustment under sec. 50 or 51 of the Local Government (Scotland) Act, 1889, or sec. 46 of the Local Government (Scotland) Act, 1894, provision shall be made for the payment to any authority of such sum as seems equitable, in accordance with the rules contained in the schedule to the present Act, in respect of any increase of burden which will properly be thrown on the ratepayers of the area of that authority as a consequence of any alteration of boundaries. This provision will apply to any adjustment consequent upon an alteration of boundaries effected after the passing of the Act made (otherwise than by agreement) under any of the said sections, whether as originally enacted or as applied by any other Act, or by any order of the Secretary for Scotland confirmed by Parliament under the provisions of the Private Legislation Procedure (Scotland) Act, 1899. These provisions are not to derogate from the provisions in force at the passing of the Act relating to the adjustment of debt. The rules in the schedule are as follows: (1) Regard shall be had to (*a*) the difference, if any, between the burden on the ratepayers which will properly be incurred by the authority of an area in respect of which an alteration of boundaries has taken place in meeting the cost of executing any of their powers and duties, and the burden on the ratepayers which would properly have been incurred by the authority in meeting such cost, had no alteration of boundaries taken place; provided that the loss of rateable area as such shall not of itself be held to be an increase of burden; (*b*) the length of time during which any increase of burden may be expected to continue. (2) The sum payable to any authority in respect of any increase of burden shall not exceed, or, if payable by instalments or by way of annuity, the capitalised value of the instalments or annuity shall not exceed, the average annual increase of burden multiplied by fifteen.

Expiring Laws Continuance.

The *Expiring Laws Continuance Act* continues until December 31, 1915 (among other enactments), the Locomotives Act, 1865, the Municipal Elections (Corrupt and Illegal Practices) Act, 1884, the Local Government (Elections) Act, 1896, the Motor-car Act, 1903, and the Unemployed Workmen Act, 1905. Any unrepealed enactments amending or affecting the enactments continued by the Act are (so far as they are temporary) to be continued to the same date.

Housing.

The object of the *Housing Act* is to make provision for the housing of persons employed by or on behalf of Government departments where sufficient dwelling accommodation is not available.

It gives power to the Local Government Board (with the approval of the Treasury) to make arrangements with any "authorised society" within the meaning of the Act for the provision, maintenance and management of dwellings and gardens and other works or buildings for persons employed by or on behalf of Government departments on Government works where sufficient dwelling accommodation is not available for those persons. The Commissioners of Works are also empowered, for the same purpose (with the consent of the Treasury, given after consultation with the board), to acquire and dispose of land and buildings, and to build dwellings and do all other things which appear to them necessary or desirable for effecting that purpose.

The Local Government Board are also authorised (with the approval of the Treasury) to assist any "authorised society" with whom arrangements are made under the Act, on such conditions as they think fit by becoming holders of the share or loan capital thereof, or making loans thereto, or otherwise as they think fit. Where the board make any such arrangements in connection with the provision or maintenance of dwellings within any borough, the council of the borough are to have the like power (with the approval of the board) of assisting the society as the board have under the Act with the approval of the Treasury.

Expenses incurred by the council under this provision are to be defrayed as expenses under Part III. of the Housing of the Working Classes Act, 1890, and the council will have the like power to borrow for the purposes of this provision as they have for the purposes of that part of that Act.

The Treasury, as and when they think fit, are to issue out of the consolidated fund such sums as may be required for meeting expenditure which is, in the opinion of the Treasury, of a capital nature incurred (with the consent or approval of the Treasury) by or on behalf of the board or the Commissioners of Works for the purposes of the Act, not exceeding in the aggregate £2,000,000. Expenses, not being, in the opinion of the Treasury, capital expenditure, are to be defrayed out of moneys provided by Parliament, and receipts arising in connection therewith are to be paid into the Exchequer.

The Treasury may, if they think fit, for the purpose of providing money for sums so authorised to be issued out of the consolidated fund, or for repaying to that fund any part of the sums so issued, borrow by means of terminable annuities for a term not exceeding thirty years, and all sums so borrowed are to be paid into the Exchequer. The annuities are to be paid out of moneys provided by Parliament, and, if those moneys are insufficient, to be charged on and paid out of the consolidated fund. The Treasury may also, if they think fit, for the same purpose borrow money by the issue of Exchequer bonds, and the Capital Expenditure (Money) Act, 1904, is to have effect as if the present Act had been in force at the time of the passing of that Act.

Within six months after the end of every financial year the Treasury are to lay before the House of Commons accounts showing the amount of any expenditure of a capital nature incurred by the Local Government Board and the Commissioners of Works respectively, and of the money borrowed and the securities created under the Act, such accounts to be audited and reported upon by the Comptroller and Auditor-General as appropriation accounts in manner provided by the Exchequer and Audit Departments Act, 1866.

The expression "authorised society" means any society, company or body of persons approved by the Treasury whose objects include the erection, improvement or management of dwellings for the working classes, which does not trade for profit, or whose constitution forbids the payment of any interest or dividend exceeding 5 per cent per annum.

In the application of the Act to Scotland, the Local Government Board for Scotland is to be substituted for the Local Government Board, and "burgh" is to be substituted for "borough."

The Act does not apply to Ireland.

The *Housing (No. 2) Act* gives the Board of Agriculture and Fisheries in agricultural districts, and the Local Government Board elsewhere, certain powers with respect to housing. These boards respectively are empowered during one year ending August 10, 1915, to acquire and dispose of land and buildings for housing purposes. The consent of the Treasury and the concurrence of the Development Commissioners are necessary for the acquisition of property, and the consent of the Treasury must be obtained before any property is disposed of. The two boards may do everything else which appears to them necessary or desirable for "housing purposes," in connection with land so acquired, and may make arrangements for housing purposes with "local authorities" and "authorised societies." "Housing purposes" means the provision, maintenance, improvement and management of dwellings and gardens, and other works or buildings for, or for the convenience of, persons belonging to the "working classes" (of which there is no definition). "Local authority" means the local authority for the purposes of Part III. of the Housing of the Working

Cottages Act, 1890 (i.e., the urban or rural sanitary authority, as the case may be). "Authorised sewer" has the same meaning as in the Act of 1875 or the Housing Act, 1909.

No loan shall be sanctioned until the Treasury are satisfied, after a public local inquiry, either (*a*) that there is an insufficiency of dwelling accommodation for the working classes, or (*b*) that the existing [illegible] provided.

The Treasury are empowered to issue to the Public Works Loan Commissioners, out of the Consolidated Fund, such sums as they think fit, not exceeding £6,000,000 in the whole, for the purposes of this Act. Expenses incurred by the Treasury not of the nature of capital expenditure, are to be defrayed out of moneys provided by Parliament. The Treasury are empowered to borrow by issuing Exchequer Bonds, Annual payments of the capital expenditure and interest are to be paid out of moneys provided by Parliament. The accounts of the Commissioners are to be audited by the Comptroller and Auditor-General, and laid before the House of Commons, and audited by the Comptroller and Auditor-General.

The Act does not apply to Ireland, and in its application to Scotland the Local Government Board for Scotland are substituted for the Local Government Board, and the Board of Agriculture for Scotland for the Board of Agriculture and Fisheries.

Public Works Loans.

The Public Works Loans Act provides for the issue by the National Debt Commissioners of £6,000,000 for loans by the Public Works Loan Commissioners, and £600,000 for loans by the Commissioners of Public Works in Ireland. The Act also provides for the writing off of £200 of the loan of £10,000 to the Evemouth Harbour Trustees, and of portions of various loans by the Commissioners of Public Works in Ireland. It is enacted that section [illegible] of the Housing and Town Planning Act, 1909, and section [illegible] of the Housing, etc., Act, 1910, (which relate to the Public Works Loans Act, 1875, and regulating to the rate of interest on loans) shall not affect loans to borrowers other than local authorities.

That section provided that any loan by the Public Works Loan Commissioners [illegible] of 1890, or for labourers' dwellings in pursuance of the Public Works Loans Act, 1875, or any Act amending the same, should bear such rate of interest not less than £3 2s. 6d. per cent per annum as the Treasury might from time to time authorise as being in their opinion sufficient to enable such loans to be made without loss to the Exchequer. Power was taken to vary the minimum rate allowed by the Public Works Loan Commissioners [illegible] to be made to local authorities. The minimum rate allowed for the time being for loans out of the Local Loans Fund, and the [illegible] ment was repealed, but there was no provision as to the rate of interest for loans to private borrowers. The present Act makes it clear that these latter will still be governed by the provisions of sec. 83 of the earlier Act.

London Electricity Supply Bill.—It was reported to the meeting of the London County Council on Tuesday that the borough councils affected by the council's Electricity Supply Bill, which is to be submitted to Parliament in the approaching Session had been asked to support the scheme. Four borough councils were reported to have expressed that it should be proceeded with, and two had given definite replies.

Snow Removal Problem.—The borough councils of London found the clearing away of the snow from the streets last week-end an awkward problem owing to the dearth of casual labour. In more than one borough the foremen had to go into the highways and byways to obtain men. In Lambeth, where in the ordinary way 300 or 400 extra men would be taken on, there were not more than fifty applications for work. In Holborn, as a rule, there would be at least 1,000 applicants on Friday; it was not possible to raise more than about 200 extra men. In the City owing to the prompt measures taken overnight to clear the [illegible] with the latter's men and the real work and the forty more sweepers worked so well that every street, alley and court in the City was clear of snow when the frost set in.

ROAD BOARD GRANTS TO LONDON.

THE POPULATION BASIS.

The Finance Committee of the London County Council this week submitted a report on the subject of the Road Board grants to London, in the course of which it is stated that the board have made a provisional allocation of the funds available on the basis of population, and that they consider that the population ratio is the most favourable basis for London which they can legitimately adopt at the present time. They further allege that "it gives London, owing to its dense population, a considerably lower population density in relation to the roads which they are obliged to maintain."

On this question the Finance Committee are of the opinion that the funds should be allocated among local authorities, as far as practicable, according to the needs of the various areas, and that such needs [illegible] by population. The Local Government Committee, with whom they have communicated on this point, agree with this view, which was advocated on behalf of the council at the conference held between the Road Board and representatives of the council on November 27, 1913. The board mention in their report that "if the share allocated to Greater London were determined by reference to nett expenditure on road maintenance, including loan charges in respect of road-crust improvements, the percentage which Greater London would get would be [illegible] population ratio." In making this calculation, however, loan charges (except those in respect of road-crust improvements) have been excluded. In an appendix to their report the board give a table showing the total expenditure on roads in England and Wales in the year 1911-12, including loan charges for street improvements, and according to these figures the expenditure in the County of London [illegible] Wales. If, therefore, the funds were allocated on this basis, London would receive 18 per cent of the amount allocated to England and Wales—*i.e.*, about [illegible] against 10 per cent on the basis of population.

Apart, however, from the question whether population forms a fair basis of allocation, the fact remains that [illegible] to authorities in the County of London do not amount to anything like the proper share of the county even on the basis of population. The total sum estimated by the board to be available for grants in June last was £6,000,000. The board show that out of the £960,000 provisionally allocated to Greater London [illegible] £802,000 had been made or indicated, but the bulk of this sum goes to authorities outside the County of London, and these grants do not in any way benefit the ratepayers of London as such. On the basis of population the amount applicable to the Administrative County of London would be about 10 per cent of the total—*i.e.*, £600,000—but the amount of grants made or indicated to London authorities was only £127,000, of which grants amounting to £112,923 had been actually made up to September [illegible] 1913.

London County Council Tramways.—The London County Council on Tuesday agreed to a recommendation of the Highways Committee that the tramway tracks in Liverpool-road should be removed and the paving of the [illegible] carried out at a provisional nett cost of £10,000. In July, 1913, the council decided to discontinue the working of the [illegible] service upon the [illegible] tracks in Liverpool-road.

Coast Sand Dunes, Sand Spits, and Sand Wastes. (By G. O. Case. Price 5s. St. Bride's Press, Limited, 24 Bride Lane, E.C.)—"A most useful little book crammed with facts culled from all parts of the world and well illustrated with photographic reproductions and diagrams. Numerous references to other works are given. Mr. Case discusses the formation and [illegible] of sand dunes and the [illegible] encountered by them when they [illegible] inland, and [illegible] on to consider protective works and the [illegible] of sand wastes. If we have any criticism to offer it is that the book is too condensed. There is certainly not a superfluous paragraph."—*Geographical Journal.*

Waterworks Plant.

MAKERS' ACTIVITIES IN 1914.

That mechanical means of water filtration continue steadily to gain ground in England is shown by the number of such plants installed during 1914 by the Candy Filter Company, of Westminster, whose Declor system has had the distinction of being selected by the War Office authorities for dealing with the water required for large bodies of the new Army, now in course of training at various Government depots. Declor plants for purifying over 1,500,000 gallons a day having been already installed at Netheravon, Codford, Corton, Heytesbury, and elsewhere.

With regard to particulars as to the work for the War Office, the difficulty confronting that department was to produce an absolutely safe and palatable drinking water from a river which, like most rivers in this country, is liable to pollution, and also is liable in rainy weather to become physically very bad. The water therefore required to be subjected to a process which would render it bright and clear when turbid, and also always render it bacteriologically pure. These requirements have been met by the adoption by the War Office of the combined Candy mechanical and Declor filter, in which the water is first subjected to the usual mechanical filtration (employing sulphate of alumina as a coagulant, if necessary), and then to chlorination, the water being subsequently dechlorinated by the Declor system.

A type of installation for the purpose of assisting existing sand beds, which may particularly interest our readers, has been supplied to the West Hampshire Water Company for dealing with the crude and flood water of the river Avon. This consisted of circular mechanical "Pre" or roughing filters, each of 20 ft. in diameter, these being the largest size mechanical filters yet constructed in the United Kingdom.

The Candy Filter Company also specialise in filters for the removal of iron and carbonic acid from water, and have supplied plants to the Biggleswade Water Board, the Chippenham Corporation, the Cromer Urban District Council, and many authorities, for that purpose; while the Hastings Corporation, who have used Candy Filters for the past fifteen years for dealing with ferruginous waters, have ordered further Candy filters of the compound type for dealing with an additional supply of 1,000,000 gallons a day.

During the past year the Candy Company have installed for the Pontypridd and Rhondda Joint Water Board a complete chemical plant for dealing with 2,000,000 gallons of peaty, plumbo-solvent water from a moorland gathering ground, the water after chemical treatment being passed through a battery of twelve Candy mechanical filters. The Cardiff Corporation also, we learn, who have been employing Candy filters for ten years, are about to lay down further such filters for 1,000,000 gallons a day.

The first installation in England by the Candy Filter Company of mechanical filters of the horizontal type, which are most economical for very high pressures, has been laid down for the city of Truro water supply, and is reported to be of great value, even when the water to be filtered is exceedingly turbid.

The export branch of the Candy Filter Company's business continues to extend, filters having been shipped during the year to Australia, New Zealand, Malay States, Japan, China, South Africa, and Madeira.

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Messrs. Bell Bros., engineers, Calder Ironworks, Ravensthorpe, Yorks, report that during 1914 many filtration plants have been supplied for the purpose of dealing with new water supplies, and extending others that have been in operation for many years.

To the Huddersfield Corporation a second installation, dealing with 1,200,000 gallons per twenty-four hours, has been erected and put into operation, and at the present time a third installation, having a capacity of 3,200,000 gallons per twenty-four hours, is now being erected, while a fourth plant, having a capacity of 1,200,000 gallons, is now on order.

Rochdale Corporation have been supplied with a plant to treat 800,000 gallons per twenty-four hours, and Blaenau Festiniog with plant to treat 480,000 gallons per twenty-four hours, and Stratford-on-Avon Urban District Council with plant to treat 320,000 gallons per twenty-four hours. To the original plant supplied to the Tonbridge Water Company in 1907, and which was afterwards extended, further extensions have been made, and the plant now has a total capacity of 2,000,000 gallons per twenty-four hours.

In connection with the installation of mechanical filters for the Burnley Corporation, which were erected in 1908, modern methods of alumina treatment have been added, and the liming plant has also been installed for treating the mechanically filtered water, and also that from the gravity beds, the quantity of water that is now being dealt with amounting to 1,700,000 gallons per twenty-four hours.

In connection with the purification of bath-water supplies, a number of installations have been erected and put into satisfactory operation, for, among others, the corporations of Doncaster, Lancaster and Stalybridge. This special apparatus is for the circulation, filtration, aëration and reheating of bath water, and carries with it many advantages, including clean water for all bathers, a point which is now receiving special recommendation.

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The Paterson Engineering Company, Limited, Amberley House, Norfolk-street, Strand, London, W.C., report that in the department of rapid mechanical filtration the many features of superiority which the open gravity type of rapid filter has over the closed pressure type, and even over the slow sand bed, have been recognised by some of the most progressive municipalities in this country and abroad. A typical example is the Paterson rapid filtration plant at Clydebank, which was opened by His Majesty the King in July. This plant of 6,000,000 gallons daily capacity enabled the authorities to dispense entirely with the former installation of slow sand filters, which have therefore been converted by the removal of the sand into pure water storage reservoirs.

At Scarborough also Paterson rapid filters are being installed, and are practically at the point of completion. In the case of a famous health resort such as this, where it is of the first importance that the purity of the water supply should be above suspicion, the decision to instal Paterson filters, after careful comparison with the various other systems, is a tribute to the special advantages embodied in the open gravity type of rapid filter.

The Paterson Engineering Company have recently secured the contract for the installation of filtration plant for the Irvine and District Water Board, where also the installation of the rapid filtration plant is intended to enable the water authorities to discard the existing slow sand filters. This installation, which has a capacity of 5,500,000 gallons per day, is probably the most important order for rapid filtration plant placed in Scotland during the year under review.

At Waskerley the Weardale and Consett Water Company have placed a repeat order for a duplicate installation (capacity 2,500,000 gallons per day) of roughing filters for the removal of the bulk of the suspended matter from the moorland water, and for the neutralisation of the natural acidity before passing on to slow sand filters.

Business in foreign and colonial fields has also shown considerable improvement during the past year. The company have secured contracts for Kobe, Japan (8,000,000 gallons per day), and for many important schemes in India and elsewhere.

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The Kennicott Water Softener Company, Wolverhampton, intimate that they have had a most successful year, and that their latest type "K" plant is being more and more appreciated by prospective buyers, on account of the fact that it is more economical than the plants made by their competitors. During last year they installed the largest water-softening plant in the United Kingdom. This has been erected at the works of the Manbre Saccharine Company, Limited, of London, to soften and purify Thames water, not only for boiler purposes, but also for manu-

[illegible] purposes. The plant is of a normal capacity of [illegible] gallons per day.

The [illegible] Thames water is one of the most difficult [illegible] which the water contains an excessive quantity of carbonic acid, and is most essential that a softener to treat water of this nature should be provided with a most efficient means of removing the precipitated mud from the bottom of the settling tank. They claim that the only method of doing this satisfactorily is by means of their patent revolving [illegible] pipes, and that [illegible] cleaner.

The firm have also received repeat orders from the South Australian Government Railways, to whom they have previously supplied fifteen plants. Other railway [illegible] world they have installed numerous other plants. Among corporations, the Manchester Corporation have installed one of their plants of 480,000 gallons per day capacity. The firm have a very large number of orders pending, and expect this year to be very prosperous.

Royles, Limited, Irlam, near Manchester, report the installation of a water softener for softening the whole of the water used in the Gloucester infirmary, including domestic supply, boiler feed, and laundry purposes. Previously the pipes and boilers were much scaled and corroded, but since the installation of the firm's plant this difficulty has been overcome. At Bristol waterworks they have put in a water-softening plant for boiler-feed purposes—capacity, 1,000 gallons per hour. For the Olympia Oil and Cake Company, Selby, they have installed an air-cleansed sand filter. This filter is for filtering the river water, which is used for manufacturing purposes. The capacity is [illegible] gallons per hour. At the works of [illegible] Limited, Liverpool, [illegible] thorpe, the firm have erected a large lime-barium [illegible] per hour. The softened water is used for feeding locomotive and water-tube boilers. By the lime and barium carbonate treatment no soda alkalinity is possible in the softened water; also there are no soluble salts produced; consequently no priming takes place, and all scale-forming matter is removed from the water. Since the adoption of this plant all trouble, both as regards priming and scaling, has been prevented. A [illegible] gallons per hour [illegible] by the Yorkshire Dyeing & Proofing Co., Limited, Arnside, is of the same type as the [illegible] and was specially designed for trans-shipment. The large reaction chamber is built up of standard cast-iron [illegible] air-cleansed sand filter. The softened water is to be used for boiler-feed and condensing purposes. The capacity of the plant is 10,000 gallons per hour. At Whittingham Asylum, near Preston, a water-hardening and filtering plant, of a capacity of 6,000 gallons per hour, has been erected. The water at the Whittingham Asylum is of a soft, peaty character, and causes considerable corrosion and deposit in hot-water service pipes. By treatment with a little clear lime water and subsequent filtration this water is hardened to the degree required, and all action on iron and lead pipes is prevented. Another contract was for an oil-eliminating plant for the Bleachers' Association, Limited, Pilsworth. For the Sheepbridge Coal and Iron Company, Chesterfield, Messrs. Royles are converting an existing water-softening plant into their system. The old reaction chambers only are being retained. The capacity of the plant is 15,000 gallons per hour.

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Mather & Platt, Limited, Park Works, Manchester, electrical, gas, textile, hydraulic and fire engineers, have had, under the circumstances, a very satisfactory year's business in all their branches. The firm have completed the several large installations of mechanical filters which were mentioned in last year's issue—namely, for the Sheffield Corporation, Rhymney and Aber Valleys Water Company, Fraserburgh, the South Staffordshire Waterworks, and in addition have supplied batteries of filters to the Grahamstown Waterworks (South Africa), the Chesterfield Rural District Council, Llandrindod Wells Urban District Council, and many other important waterworks at home and abroad, including the Malay States, New Zealand, and other colonies. A very important installation has been erected near Calcutta to supply the district owned by the Alliance Jute Mills with drinking water for their workspeople, as well as for general use in the mill. This installation has caused widespread interest in waterworks circles in India on account of the exceptionally good results obtained when filtering river Hooghly water, even in its worst state. The Tynemouth Corporation have also installed one of Mather & Platt's filters, and are making experiments, with the intention of adopting mechanical filters for the purification of the water supply of the whole district. Mather & Platt are now engaged on a most important installation for the Oldham Corporation waterworks, comprising eighteen filters, each 9-ft. diameter, to deal with [illegible] gallons per hour. When completed this will be one of the most up-to-date installations of mechanical filters in the country. A notable success has been achieved with their novel [illegible] proved to be efficient and economical.

The firm have supplied turbine pumps for increasing duties—widening their sphere of efficient usefulness. Large numbers of their well-known multi-chamber type pumps have been installed in collieries, where the duties have frequently been in excess of 1,000-ft. lift. They have further installed pumps of similar type for hydraulic purposes, generating a [illegible] field for the adoption of turbine pumps is for boiler-feed duties. Mather & Platt have installed quite a number of such pumps driven by belt, by motor, and by steam turbine. All such pumps have given every satisfaction. Their low-lift type of pump continues to find favour for varied uses, and a recent adaptation of this pump has been supplied to paper makers for handling pulp. The design of the pump lends itself to rapid examination, having the cover in two parts, the outer part being hinged, and held in position by wing nuts. The impeller is of the non-shrouded type. Should there, therefore, be any congestion or other impediment, the pump can be examined internally in a very short time, and the joint easily and quickly made.

[illegible] pany have supplied several filtering installations for the purification of water supplies, the principal of these having been a large installation for the Morley Corporation, and another for abroad.

They have also supplied some small filters suitable for 100 to 300 gallons per hour, for the purification of drinking water for small country village supplies, the simplicity of this type of filter being much appreciated where the filters are looked after entirely by unskilled labour.

In connection with the purification of water in swimming baths, the "Turn-Over" filter and purification apparatus continues much in favour, an order having been received recently by the firm from the Batley Corporation for a filtering plant similar to that supplied to the Brighouse Council.

In connection with this work, by the "Turn-Over" filter system of purification, a guarantee is given for the production of an absolutely colourless water and the elimination of pathogenic germs.

The company believe in the motto "Seeing is believing," and therefore invite inspection of their plant, as they think this is more likely to convince people of its advantages than anything else.

Pumping plant supplied by the Pulsometer Engineering Company, Limited, includes an installation at the West Gloucestershire Company's California pumping station, consisting of two deep-well pumps with pump barrels fixed 300 ft. below the ground level, delivering into a water softener on the ground level, the softened water then being pumped by a Pulsometer high-efficiency turbine pump to a reservoir 3 miles away, against a head of about 350 ft., [illegible] pound condensing steam engine. This installation, which is working very satisfactorily, is of interest, inasmuch as the high-speed turbine pump, running at 1,000 revolutions per minute, is working in series with a slow-speed well pump working at 15 revolutions per minute. Another installation is at Winchester, consisting of two high-speed Pulsometer

turbine pumps, direct coupled to a high-speed gas engine, the pumps being arranged so that one pump only can be used for pumping into the main reservoir, and when coupled direct both pumps can be worked in series and then deliver water into the high-level reservoir. The gas engine and pumps are mounted on one bedplate, and make an exceedingly compact combination.

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George Kent, Limited, 199 to 201 High Holborn, London, W.C., report: During the past year a record has been established in the number of Venturi meters manufactured by them, the actual output being greater than at any previous period in the firm's history. Among the many contracts secured by them during 1914 may be mentioned those for the Venturi meters for the Egyptian Government in connection with the Nile Delta drainage project at Baltim and Mex pumping stations. An exhaustive series of trials have been carried out under the supervision of the Egyptian Government engineers to test the accuracy of Venturi meters against specially constructed tanks of known capacity. The results obtained with the meters were highly satisfactory, and but for the outbreak of war considerable contracts for the Agricultural and other departments would doubtless have been received. With regard to the prospects for 1915, although the firm's general business is bound to be affected to some extent by reduction in municipal expenditure, the outlook is tolerably good, and it is confidently expected that the business already in hand, and any that may come along, will keep them well employed at any rate during the first half of the year.

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Ruston, Proctor & Co., Limited, Sheaf Ironworks, Lincoln, report: Among the large number of gas and oil engines supplied by us in 1914 we would mention, in connection with United Kingdom water supply schemes, the semi-Diesel engines supplied to the Sandgate Urban District Council for their waterworks, and the three coupled gas engines, each of 120-b.h.p. test load, supplied to the Sheffield Corporation, in connection with a new reservoir scheme in Ewden Valley. Two of the gas engines will work on anthracite or coke as fuel, and the remaining one on wood refuse. They are arranged to drive direct-coupled dynamos by means of rope gearing. These engines are similar in design to the double set of Ruston gas engines erected and started at the Ryde waterworks last year.

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During the year 1914 Messrs. Tangyes, Limited, Birmingham, have been improving the details of their various gas engines, and have now introduced their "H" type gas engine, with "hit-and-miss" governing. With the exception of the variable admission governing, this embodies all the leading features of their "T" type gas engine. The firm are also offering their suction gas producers with revolving plate grates for use with anthracite, gas coke and charcoal. This type of grate enables very small-size fuels to be used, and the ash, &c., can be readily cleared from the fire grate. A further improvement is the introduction of Messrs. Tangyes' patented arrangement on the crude oil engine, semi-Diesel type, which makes it possible to start the engine from cold without the use of petrol or other light spirit, and without the use of a lamp or external heat of any kind. This is effected by means of electric ignition and without the use of high-compression pressures. The introduction of the firm's famples- to-fined oil engine belongs to the current year.

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The Ransome-verMehr Machinery Company, Ltd., Brunswick House, Westminster, obtained early last year a filtration contract for treating 60,000,000 gallons of water per day for the Toronto Municipality. The contract price was, approximately, £220,000, and included not only the firm's system of Ransome continuous filters, but all buildings, foundations, pipe track, pumping apparatus and coal-storage buildings. The contract was a joint one, the Ransome-verMehr Company being responsible for the engineering portion of the work, and Messrs. William Cowlin & Son, of Bristol and Toronto, for the building portion, including the pipe track and the foundations. The execution of the work has been carried out expeditiously up to the present moment. One half of the equipment is to be completed and ready for working by September 30th, and the balance by December 31st next. The company have also carried out a contract for the Crown Agents for the Colonies for the supply of Ransome continuous filters to treat 3,000,000 gallons of water per day. The plant consists of ten filters, and the firm have also furnished their patented coagulating apparatus for the addition of alumino-ferric to the water under treatment. This plant is for the Kingston General Commissioners, Kingston, Jamaica. The company have completed the erection of three 10-ft. Ransome filters for Mr. Thos. F. Harvey, the waterworks engineer of Merthyr Tydfil, these filters being guaranteed to treat 1,200,000 gallons of water per day of twenty-four hours. In addition, they have executed a number of orders for single filters for waterworks companies and railway companies both at home and abroad.

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In cases where the lime process is employed it is possible to obtain excellent apparatus for adding lime to the water in exact measured quantities, so that water may be softened or treated with an excess of lime for sterilisation in accordance with Dr. Houston's recommendations in the case of the London supply. Plant such as that installed by the United Water Softeners, Limited, Kingsway, at a good many places during the past year demonstrate the ease with which water may be so treated.

It is also evident, however, that a very formidable competitor to the lime process in the softening of public water supplies is the much-discussed "Permutit" process, which has now been tested in this country for over four years, and certainly appears to have justified the claims made for it on its introduction. A large water-softening plant on the "Permutit" system has been installed by the West Cheshire Water Company at their pumping station at Hooton, Cheshire, which supplies some eight townships.

The great advantages of the "Permutit" process as applied to the treatment of public water supplies are its compactness, and the fact that neither sludge nor precipitate is formed at any stage of the process; while the removal of the hardness of the water is complete.

"Permutit" softeners have now been installed by the Portsmouth, Hampstead, Fulham, South Shields, Braintree, and several other Boards of Guardians at their infirmaries, with very satisfactory results; as well as by H.M. Office of Works for the Royal Courts of Justice, and a very large number of private users in town and country.

During the past year some exceptionally interesting results have been obtained by combining the Lassen-Hjort and "Permutit" processes in the same softening plant—the combined process being especially applicable to waters of initially high degrees of hardness which would be too expensive to treat entirely by "Permutit." In such cases the bulk of the hardness is removed by lime treatment, and the water then finally filtered through a layer of "Permutit." This process has been successfully adopted by Messrs. Woolcombers, Limited, of Bradford, at their Wapping works; Messrs. Wm. Playne & Co., Limited, Minchinhampton, Stroud, and many others.

Wall Calendar. An excellent wall calendar reaches us from Messrs. W. E. Horsman & Son, 127 Pendelton road, Streatham, S.W., the well-known specialists in general sanitary fittings and ironwork. Of moderate size, the date tables are yet sufficiently large to enable them to be read without difficulty at a reasonable distance, and the usefulness of the calendar is enhanced by the postal information which finds a place on the back sheet.

Public Health Law. This concise little work[1] has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

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[1] A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

Road-Making Materials and Appliances.

MANUFACTURERS' REPORTS FOR 1914.

efficiency and speed in spraying operations are a ing, spraying and gritting roads, the sooner are the public able to enjoy the benefits of the process, the advantage of any spells of fine weather, for the rapid output of their machines renders them pre- work in the quickest possible time. The satisfaction given by the Taroads Syndicate, Limited, under the supervision of its chairman, Sir Herbert Mackworth Praed, Bart., is proved by the annually increasing mileage of roads treated by the syndicate. In the year 1914 all previous records were, we understand, eclipsed. The Taroads Syndicate, Limited, who are interested in matters concerning the surface treatment of roads.

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Among the roads laid by Highways Construction, Limited, Finsbury-court, London, E.C., during 1914 may be mentioned a section in Essex, about 6 miles long, between Romford and Brentwood; a contract 23,000 sq. yds. already laid there, and a stretch of named is an interesting modification of the firm's previous practice, and consists of two-coat work on system, which is known as voidless asphalt macadam on account of the perfect density secured in mixing the asphalt, is applied in four different methods, according to the character of the road and the estimated traffic to be borne by it. These are: (1) Single-coat work, where an excavated road is laid with a binder course of asphalt macadam and sealed with a flush coat of pure bitumen; (2) double-coat work, in which a wearing carpet of asphalt is laid on the macadam roads (without excavation or scarifying) and on granite setts; (4) asphalt paving on concrete foundation to meet the requirements of city streets. around London at Hornsey, Kensington, Wandsworth, large contracts have been carried out at Cornwall, Bristol, Cheshire and Surrey.

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with the special advantages of the well-known increasing year by year, report the Oxford Steam Plough Company, Cowley, Oxford. During the past year the firm have designed a special one, and two-tyne scarifier for use on small tandem patching rollers an asset to rollers of this description, since patching can only be done successfully after the surface of the road has been picked up. This scarifier is fitted on the right-hand side of the roller, immediately in front of the hind road wheel, and, being always ready when required, dispenses with the necessity of extra men following the roller about from place to place for the purpose of picking up the road before putting on the patching material, a fact which will readily appeal to road-roller users with whom economy is a consideration.

Creosoted deal paving long ago established itself as an economical system of paving for city thoroughfares with heavy omnibus traffic, and its usefulness has been more pronounced than ever since the advent of heavy motor omnibuses and other such vehicles. During the past year, however, there have been many extensions of this system into suburban thoroughfares, and in many cases large areas have been laid in thoroughfares bounded by hedges and ditches. The use of old road metal—where it is sufficiently clean—for concrete and a shallow block brings this paving into a much larger sphere, and as soon as the war permits prices to be somewhere near normal a very large amount of this paving will, the Improved Wood Pavement Company, Limited, 46 Queen Victoria-street, London, E.C., inform us, probably be put in hand.

Sales of the Gold Medal Tarco of Messrs. R. S. Clare & Co., Limited, Stanhope-street, Liverpool, are steadily increasing, and its use is becoming more popular than ever among surveyors, as will be shown by a reference to our map shown on p. (2) of the present issue, which clearly indicates that Tarco is used practically all over England and Wales. Of course, its use is not confined to this area by any means, very large quantities also being employed in Scotland and Ireland, to say nothing of an extensive colonial trade. The company find that surveyors are tending, owing to their growing conviction of the failures of tar-macadam, when constructed with ordinary tar, more and more toward the use of a standardised binder which contains the constituents so necessary to produce the maximum adhesive power —namely, a considerable proportion of pure bitumen and other agglomerating substances—and such a material, it is claimed, is Bi-Tarco. A large number of surveyors are now specifying for this material when purchasing coated stone from quarries. The firm's other bituminous compositions used in road construction are well known. With regard to the company's tar-spraying machines, these embody the very latest principle, and combine a maximum of efficiency with a minimum chance of breakdown.

During the past year, in addition to the ordinary activities of the Cliffe Hill Granite Company, Limited —of Markfield, near Leicester—in the way of supplying granite setts, kerb, and broken macadam, they have established a well-equipped and up-to-date works for coating their well-known Cliffe Hill granite with any of the proprietary compounds, and with their own bituminous binder. The Cliffe Hill granite is eminently suitable for tarred macadam, and the firm's enterprise is proving a great success, their bituminous coated granite having been supplied to many county, urban and rural district councils. The Cliffe Hill artificial stone paving, hydraulically pressed, and every piece guaranteed of a uniform quality right through, thus giving even wear, is still finding further favour with the largest users of paving, and their architectural dressings, cills, heads, coping, &c., are also in good demand, either in plain concrete or coloured to specification. The developments at the quarry itself from which the granite is obtained are of a progressive nature. The lower beds of granite are being worked, and the quality still holds of "the best," as evidenced by the numerous repeat orders.

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Millars' Timber and Trading Company, Limited, during the year 1914 experienced very great difficulty in obtaining ships from Australia to transport Jarrah paving planks to England fast enough to cope with the greatly increased demand for Jarrah. This difficulty has now been surmounted, and the company are in a position to execute orders to any extent promptly from stocks now landed.

During last year Messrs. Mann's Patent Steam Cart and Wagon Company, Limited, Pepper-road Works, Hunslet, Leeds, did a considerable amount of business in road plant with public bodies, and especially with their small patching rollers. Among other customers during the twelve months were the Liverpool Corporation, Nuneaton Corporation, Worcestershire County Council, Durham County Council, Hebden Urban District Council, Leeds Corporation,

and the Barry Urban District Council. In addition to the above, the firm have sold several of the Aitken patent pneumatic tar-sprayers to the Aitken Tarroads Syndicate, of Glasgow, and these have been very extensively used both for road construction and for treating existing roads mostly in Scotland. As our readers are aware, Mr. Aitken is the county surveyor for Fife, who has specialised on the question of dustless roads, and his machines are now constructed so as to deal with the heaviest bituminous compounds. In addition to patching rollers and tipping wagons for road construction the firm have also supplied a number of municipal wagons with interchangeable bodies for dealing with refuse collection and road watering. Their orders have included a further order for the borough of Devonport, who already have seven of their machines in regular every-day work.

The Adamant Stone and Paving Company, Limited, of Palace Chambers, 9 Bridge-street, Westminster, S.W., have had a very busy year during 1914 supplying their Nonslip "Aberdeen Adamant" footway paving slabs. They have been fortunate in obtaining freights, and as much as 15,000 yds. super. of paving was shipped during one week from Aberdeen to London, in addition to cargoes for other ports. They have also kept up their large stock of paving slabs at their works at Dancing Cairns Quarries. At the present time they are able to deliver paving in large quantities regularly, twice a week, to London, thus enabling them to maintain large stocks on their various wharves, from which immediate deliveries are effected.

The British Westrumite Asphalt Company, Limited, Imperial-road, Fulham, London, S.W., report that since the completion of their refining and liquefying factory in July last, they have been very fully occupied. They have laid sections of various specifications, including 1-in., ¾-in., and ⅝-in. Westrumite asphalt carpet to ordinary macadam roads; also their asphalt is being used very extensively in connection with tar-macadam as a void sealer. Briefly, the specification is: On prepared ground 2½-in. layer of 1¾-in. mesh tar-macadam, consolidated to 1¾-in., 1¼-in. layer of ¾-in. mesh tar-macadam, consolidated to 1 in.; then take Westrumite asphalt and limestone dust in proportions specified—which makes a very fluid grout. This is broomed over the tar-macadam surface until the voids are completely sealed. By reason of this Trinidad asphalt grout being applied in a cold, liquid state, and the temperature being similar to the tar-macadam, wherever there is a crevice this grout will trickle in and solidify. Therefore it will be seen that the tar-macadam immediately takes a place with asphalt-macadam, as, the voids being permanently sealed, all tar-painting is entirely done away with. The company have other specifications which apply to tar-macadam, and which are being taken up by surveyors very largely, as they can men can fix and seal the work, without any danger of trouble after. The orders in hand for 1915 will keep the firm very busy indeed.

The supply of Carmac was started by Clarmac Patent Asphalt Company, Limited, in the middle of 1911, and the material as a tar and colchbat fine slag coated with tar to Road Board specification—found such instant favour that, in order to cope with the demand, Clarmac Roads, Limited, was formed. The original works at Bilston soon proved insufficient, and fresh ones were secured at Chatterley. A Ransome combined drum and mixing plant is being installed at each to make sure to meet the demand, and the company have already supplied Clarmac to the Southend-on-Sea, Maryleboue, Beckenham, Coventry, Edmonton and Aldershot councils, among others.

A large amount of interesting road work—both tar-macadam and bituminous—has been carried out during the past year with Koehring hot mixers supplied by Messrs. A. A. Byrd & Co., 50 Cannon-street, London, E.C. The Essex County Council have laid a fine stretch of bituminous road through Epping on towards Harlow, and also at Barking-side and Ilford, and, owing to their success with this machine, have given repeat orders. The Kent County Council have continued the Bromley-Sevenoaks main road, and have reached a point beyond Knockholt. This road is well worth inspection, and the materials have been entirely made by a Koehring mixer. Messrs. Byrd have now in hand the second repeat order from this council. The Bucks County Council have two of these machines at work, and have done some fine tar-macadam work with them on the Beaconsfield and Penny Stratford districts. A number of Scottish county councils adopted these machines last year, and are doing most successful work with them. Some of these are being used in the quarries, the metal flowing direct from the stone breaker into the hopper on the hot mixer, the finished material being elevated on a special hoist attached to the machine and discharged direct into the wagons. A number of machines are on order for delivery this year.

During 1914 Messrs. John Yates & Co., Limited, Aston Manor, Birmingham, did more than ever with county and other councils in road-making tools, tar-boilers, sprayers, &c. They quite anticipate 1915 will be a very good year for that department of their works, as many roads which have been literally churned up by heavy motor traffic in connection with manœuvres and transport will have to be repaired. They also anticipate that the withdrawal—more or less—of German competition will increase the demand for their British tip wagons and British diaphragm pumps. Since the commencement of hostilities the demands made upon the works by the British Government and the Allies have been exceedingly large, so much so that the firm are one of those whose men are not accepted by the Government as recruits, as it is considered they can serve their country equally well here; but the company have made special arrangements to give the best possible attention to all their regular clients during these trying times, recognising that upon the cessation of hostilities it is to them they will have to look for the maintenance of their output and the continuance of their prosperity.

Messrs. T. Toward & Co., Limited, Ouseburn, Newcastle-on-Tyne, have again experienced a busy year in the special goods they manufacture in the shape of road-makers' and contractors' plant, and so forth. Since the outbreak of war they have been kept exceedingly busy on accelerated Admiralty work. They have also been successful in securing a fair amount of orders that were previously sent to Germany. In connection with tar plant, they have experienced a large increase in the demand, particularly in tar-macadam mixing plant of their special design, which gives a continuous output.

A year of considerable activity is reported by the Dussek Bitumen Company, Canal Bank, Deptford, London, S.E. The use of "Trinidite," the firm's natural bitumen binder for grouting macadam, is rapidly extending, and their "Bitite," employed in place of pitch and oil for grouting granite setts and laying wood block paving, is also making good headway. "Trinidite," it may be mentioned, has been laid by the Middlesex County Council on the St. Albans road, the work, it is claimed, being the longest length—1¼ miles—yet carried out with any material on the grouting principle. In nearly every case the material has been put down on motor-'bus and other heavy-traffic routes, and it is giving entire satisfaction, there being no single instance of failure.

The Tarmac Limited, Ironsmill, Wolverhampton, are the only firm engaged in supplying tarred macadam to all parts of the country. During last year they supplied the following county councils with material: Berkshire (14,000 tons), Oxfordshire (30,000 tons), Hampshire (20,000 tons), Warwickshire (40,000 tons), Worcestershire (15,000 tons), Lancashire (13,000 tons), Gloucestershire (38,000 tons), Wiltshire (6,000 tons), Notts (30,000 tons), Derbyshire (6,000 tons), Carmarthen (2,000 tons), Somerset (5,000 tons), East Sussex (3,000 tons). All these orders were in connection with Road Board schemes for main road construction. It may also be mentioned that arrangements have been made at other works for the supply of much larger quantities. The firm have a huge quantity for disposal this

year, and the quality of the material is being thoroughly maintained.

The road material supplied by the Anglo-Mexican Petroleum Products Company, Limited, of Finsbury Pavement, London, E.C., and known as all asphalt. The Anglo-Mexican Mexphalte, which is practically free from grit and has the quality of increasing in value and durability during the first years. The various types of [illegible] mixing plants, approved by the Board of Agriculture and Fisheries, are capable of turning out first-class material by the most [illegible] process in exact and standardised character can readily be attained in its use. Considerable progress has been made of late [illegible] for the manufacture of asphalt-macadam, the Anglo-Mexican Company having designed an entirely new portable mixing plant constructed on one chassis, which can be hauled by an ordinary 5-ton tractor, and capable of [illegible] any [illegible] of Mexphalte macadam per day. This plant, which [illegible] has been [illegible] to meet the demands of [illegible] ture their own asphalt-macadam, and is so designed that there is complete and easy control of temperature throughout the mixing process. The alternative method of using bitumen—*i.e.*, for grouting—is also very successful, and numerous reports of its use in this direction from all parts of the country during the past year point to its economy and efficiency under heavy traffic. As an example, it may be mentioned that a Mexphalte grouted road in [illegible] Yorkshire, which was subjected to exceptional stresses owing to the passage of heavy guns for the coast, emerged from the ordeal quite successfully, whereas a tar-macadam road in the locality showed signs of damage under the same conditions. The practical cessation of the import of German asphalt for mastic blocks has stimulated the use of Mexphalte for the manufacture of mastic asphalt, and it is satisfactory to note that the products from British sources of supply are fully equal to those produced from foreign materials. During the war the company is offering specially low prices to public authorities in order to co-operate as far as possible with efforts made to relieve local unemployment by carrying out road construction work. Their liquid bitumen for road dressing, known as Fluxphalte, is also finding an increasing market, especially abroad. In South Africa, where the condition of the roads calls for urgent treatment, Fluxphalte has been largely used for surface spraying with admirable results. With regard to work [illegible] roads treated with Fluxphalte early in the year are entirely satisfactory, the dressing having furnished an efficient dust-layer during the summer and protecting the road from wear during the wet winter months.

MOTORS AND THE ROADS.

THE QUESTION OF CONTRIBUTIONS.

Addressing a meeting of the Executive Council of the County Councils' Association at the Westminster Guildhall on Wednesday, Mr. Herbert Samuel, President of the Local Government Board, stated that the Government would appoint a committee and ask Parliament to appoint another to deal with two aspects of motor traction—the technical question of weight and construction, and the wider question of the proper payment the owners of those vehicles ought to make, if any, towards the upkeep of the roads.

In war, as in peace, motor lorries, motor 'buses and traction engines tore up the country roads, although the energies of a considerable number had been devoted with even more success to the roads of France and Belgium. (Laughter.)

The Road Contractor's Joke.—A Devonshire road contractor was being taken to task by his surveyor because he had not the required quantity of road metal broken and ready for use. "What can I do?" the old man asked. "I can get no help. My son, who used to assist me, has joined the Navy, and is now with the North Sea Fleet. If you tell me I must get the stone," he concluded, "I will send to Sir John Jellicoe—tell him the roads cannot wait, and that he must send my son home."

ASSOCIATION OF SOMERSET SURVEYORS.

ANNUAL MEETING AT BRISTOL.

The [illegible] Association of Somerset Surveyors was held at the Merchant Venturers' College, Bristol, on Saturday last, when there was a [illegible]

Mr. W. A. Collins, surveyor to the Bridgwater Rural District Council, took the chair, and introduced Mr. F. W. Jones, ASSOC.M.INST.C.E., engineer and surveyor to the Frome Urban District Council, the new president.

In the course of his inaugural address Mr. Jones reminded the members that since the last annual meeting many things had transpired to alter their relationship. In March last they parted with Mr. Chapman [now county surveyor of Kent], whose deep interest in the association was always so helpful. In his place they had the pleasure of welcoming back among them Mr. Stead to the position of county surveyor, which position they knew he would fill with honour to himself and helpfulness to them all. Mr. Stone also had left them to take up the important appointment of county surveyor in North Devon, and their best wishes had gone with him. Proceeding, Mr. Jones said the advent of the war had affected the past year's work, as it had affected all other undertakings in the country in a greater or lesser degree, and they were left to regret the reduction it had caused in the number of their meetings and, consequently, the number of papers presented for their consideration. In the interests of the association he must emphasise the necessity for a more generous response to the requests made from time to time for papers, and he intended to suggest to the Executive Committee the desirability of drawing up a list of subjects upon which papers would be acceptable. If that suggestion were followed they ought to get from eight to twelve papers every year, and in so doing they should materially strengthen the usefulness of the association.

A vote of condolence was passed with Mr. F. Parr, borough surveyor of Bridgwater, in his recent bereavement by the death of Mrs. Parr, after a long and severe illness.

Messrs. W. A. Collins and J. Ace Beynon were elected vice-presidents, and Mr. D. Edwards, borough surveyor of Taunton, was re-elected secretary.

The Executive Committee were elected as follows: Messrs. Geo. Alves, Chas. Durie, Edward Stead, F. Parr, R. Stephens, L. Caplen, C. H. Sunderland, and J. Johnson.

With regard to the premium scheme, the best paper submitted during the year was by Mr. Chas. Durie, surveyor to the rural district council of Williton, entitled "(1) Highway Administration in the Williton Rural District; (2) The Acland Highway Act Amendment Act, 1885." The premium, to the value of two guineas (given by Mr. H. T. Chapman, county surveyor of Kent), was duly presented to him.

Three new members were admitted, making a total of sixty-three.

The president gave a hearty welcome to the visitors, who included Mr. Owen Baines, of Paignton.

Mr. F. Parr, borough surveyor of Bridgwater, was elected an honorary life member of the association in recognition of his untiring energy and influence in the welfare of the association.

The members were subsequently entertained to tea by the president.

Housing of Ayrshire Miners.—The copy of a report forwarded to the Local Government Board, and compiled by Mr. David Andrew, chief sanitary inspector, dealing with the housing of miners in the northern district of Ayrshire, has been submitted to the Public Health Sub-committee of the District Committee of the county council. The report is a lengthy one, dealing with the parishes of Stevenston, Kilwinning, Irvine, Dreghorn, Dalry, and Kilbirnie, and gives information as to the state of progress of the repairs and improvements instructed to be carried out on the various miners' rows some time ago. On the recommendation of the Public Health Sub-committee it has been agreed that as regards those cases where the proprietors are not proposing to carry out washing houses and coal cellars the opinion of the Local Government Board be obtained, and that proprietors who do not proceed with all necessary repairs, or with part of them, without delay will have legal proceedings taken against them.

Sewerage and Sewage Disposal Appliances.

MANUFACTURERS' REPORTS.

The year 1914 has been one of pronounced activity with the Pulsometer Engineering Company, Limited, in regard to pumping installations in connection with sewerage, and their Stereophagus pump, the construction of which is doubtless well known to our readers, is becoming a great favourite among sewerage engineers. Its simplicity and reliability, together with its extraordinary power of dealing with solids, makes the pump of unequalled value for work of this character.

Among the installations for which pumps have been supplied by this firm might be mentioned the following sewerage or drainage works: Southend-on-Sea, Margate, Evesham, Cannock, Glastonbury, Harpenden, Horbury, Rossington, Wanstead, Whittington and Newbold, Porthcawl, Urmston and Flixton Joint Drainage Batley, Wath-upon-Dearne, Seisdon, Windermere, Whitstable, Petone (N.Z.), Warwick, and Leyton.

* * * *

Messrs Manlove, Alliott & Co., Limited, of Nottingham, have carried out a considerable amount of work in connection with sewage disposal during the past year. At Ipswich they have supplied a sewage ejector plant, consisting of a pair of their automatic pneumatic ejectors. These ejectors are automatic in action, and so arranged that one ejector of each pair is always capable of receiving the inflow of sewage. The arrangement of the ejectors is such that both of them cannot be filling or discharging at the same time. A single ejector has also been supplied to the Ipswich sanatorium. Messrs. Manlove, Alliott & Co., Limited, supplied an ejector to this institution about two years ago, and the one just supplied is a duplicate of the previous one, and is arranged to work in conjunction with it. The ideal arrangement of these ejectors is to instal them in pairs. This permits one to be filling while the other is discharging, and vice versâ, thus providing means for dealing with an uninterrupted flow of sewage. The filter press is a well-known speciality of Messrs. Manlove, Alliott & Co., Limited, and we understand that in this department of their business they have had a busy year. Among the filter presses supplied for dealing with sewage sludge may be mentioned a plant for the urban district council of Ashton-in-Makerfield. This plant consists of two sludge presses, lime mixer, two steel sludge rams, two chain pumps, &c. A further filter press for sludge is being made for the corporation of Ashton-under-Lyne.

* * *

The Ames-Crosta Sanitary Engineering Company, Limited, of Nottingham, report that the steady increase in their business in recent years has been maintained during the past year, especially in the department dealing with sewage disposal appliances, in which the sales during 1914 were more than double those of the previous year. Among the appliances in question may be mentioned rotary and rectangular sprinklers, fixed sprays, intermittent dosing valves, patent tiles, Fieldhouse patent sedimentation tank, power and hand driven screens and sludge elevating apparatus, filtering material washers, and all types of penstocks, valves and floating arms.

* * *

Messrs. Adams-Hydraulics, Limited, report a very successful year, the output having by far exceeded that of any previous year. It is specially gratifying to note that the value of orders received during the last six months of the year is above that of the corresponding six months, notwithstanding the unsettled state of the country in consequence of the war. In every department of their work, whether in sewage purification plant, sewage lifting plant, or general ironwork, a steady and satisfactory increase has been maintained, and the sale of their patent conical manhole covers is far in excess of former years, a fact which conclusively proves that its special features render it wholly unique.

* * *

Messrs. Tangyes, Limited, of Birmingham, have supplied a number of pumps for raising sewage, in particular, their sewage type Tan-Gyro centrifugal pumps. Among others may be mentioned 4-in. pumps of this type for Hartley Wintney (Hants), and Witney (Oxon), two 6-in. pumps for Weedon; one 8-in. pump for Rochdale, and two for Hemsworth; and two 10-in. pumps, each capable of delivering 100,000 gallons per hour, for Banbury. In addition to this, their vertical treble ram pumps have been adopted for raising sewage at Buckingham, Cleethorpes, and Banbury. The pumping plant at Bedford includes one 8-in., two 13-in., and one 15-in. Tanyge centrifugal pumps, while at Faversham they have erected a double-acting vertical ram pump for raising sludge.

* * * *

Messrs. Tuke & Bell, Limited, of Tottenham, report that, notwithstanding the war, which has so seriously affected business throughout the world during the last five months, they are able to report that their volume of business continues steadily to increase, and the advantages of their special apparatus, in connection with sewerage, sewage disposal, water softening, and water filtration, continue to be appreciated by surveyors and civil engineers. They have supplied during the year large numbers of their "Grip" road covers, most of these being repeat orders from councils who have already proved the efficiency of this cover. They have put down a considerable number of ejector and sewage lift installations, and have received repeat orders for these from the York City Council and from the Hayes Urban District Council. Their Pulsator ram system of fixed sprays, which provides a varying pressure and distribution, and a thorough clearing of the jets by means of the instantaneous maximum pressure, have been installed in several places. They have supplied, or have in hand, distributors for Chester, Middleham, Bunbury, Hertford, Beeston, Pateley Bridge, Gayle, Barrasford, Ludworth, Grantham, Colwall, Southborough, Reading, Southam, Gloucester, Cockermouth, Maltby, and other places; and their "Ideal" revolving distributor, which is positive in action, and has no perforations liable to choke, is being increasingly used. They have supplied also the complete apparatus and carried out the constructional work for sewage purification installations for a number of sanatoria, housing schemes, hospitals, industrial schools, agricultural colleges, orphanages and factories, in addition to a large number of mansions and country houses. During the year they have considerably developed their business in water softening apparatus and water filters, and at the present time are very fully occupied, having made large extensions to their works, with extensive contracts for water filters for H.M. War Office.

St. Pancras Municipal Cemetery.—St. Pancras municipal cemetery, the first to be established when the Burial Act closed the old churchyards and crypts some sixty years ago, is now entirely free from debt, the final loan instalment just having been paid. Thousands of pounds profit have been made out of the cemetery, which still has 70 acres of ground available for interments.

A Glossary of Road Terms (By H. Percy Boulnois, M.INST.C.E., St. Bride's Press, Limited, 24 Bride-lane, E.C., Price 2s. nett).—The movement towards standardising the principal roads throughout the United Kingdom has rendered it necessary to correlate the nomenclature of road terms in use in different districts, and Mr. Boulnois has compiled a glossary with the hope that it may form a basis for such a correlation.—*Times Engineering Supplement.*

Ayrshire Water Supplies.—At a meeting of Irvine and District Water Board the tender of Messrs. Wilson, Kinnaird & Marr (Limited), Glasgow, to lay a new main pipe from Munnoch reservoir to Greenhead Glen, at a cost of £3,599 was accepted. It was stated that the board had decided to abandon the said reservoir, and it had been agreed to adopt the Paterson system of rapid filters. The board accordingly accepted the quotation of the Paterson Engineering Company (Limited) to provide the new installation at a cost of £13,175, together with an oil engine at £145.

Literature of Municipal Engineering in 1914.

[Any book included in this summary will be forwarded, post free, on application to the St. Bride's Press, Limited, 24 Bride Lane, Fleet Street, London, E.C. The published price must be enclosed.]

In accordance with our usual custom, we publish below a summary of the books dealing with subjects of interest to municipal engineers which have been issued during the past year. In doing so we may, perhaps, direct the attention of our readers to THE SURVEYOR Book Department, through which technical books, issued by various publishers, may be obtained from a single source with the minimum amount of trouble. Orders by post receive careful and prompt attention, and particulars and lists of books on any desired subject may be obtained on application. The references in brackets are to the volume and page of THE SURVEYOR in which a review has appeared.

Annuals and Year-books.

"Baggar's Contracting World Directory, 1914." Edited by C. W. Baggar. Price 10s. 6d. London: R. Baggar & Co. (Vol. 46, p. 451.)

"Hazell's Annual, 1914." Edited by T. A. Ingram, M.A. Price 3s. 6d. nett. London: Hazell, Watson & Viney, Limited. (Vol. 45, p. 29.)

"Lockwood's Builders' Price-book, 1914." Edited by F. T. W. Miller, A.R.I.B.A. Price 4s. London: Crosby Lockwood & Son. (Vol. 45, p. 418.)

"Surveyors' Tables and Diary for 1914." Price 1s. paper, 2s. leather. London: Metchim & Son. (Vol. 45, p. 300.)

"The Civil Engineer's Who's Who." Second (1913) Annual Issue. Price 2s. 6d. nett. London: St. Bride's Press, Limited. (Vol. 45, p. 29.)

"The Engineer's Year-book of Formulæ, Rules, Tables, Data, and Memoranda, for 1914." A compendium of the modern practice of civil, mechanical, electrical, marine, gas, and mine engineering. Compiled and edited by H. R. Kempe, M.INST.C.E., M.I.MECH.E., M.I.E.E. Price 15s. London: Crosby Lockwood & Son. (Vol. 45, p. 417.)

"The International 'Whitaker,' 1914." Price 2s. (Vol. 45, p. 418.)

"The 'Mechanical World' Pocket Diary and Year-book for 1915." Price 6d. nett. Manchester: Emmott & Co., Limited. (Vol. 46, p. 726.)

"The Municipal Year-book, 1914." Price 15s. nett. London: The Municipal Journal, Limited. (Vol. 45, p. 685.)

"Willing's Press Guide." Price 1s. London: James Willing, Limited. (Vol. 45, p. 251.)

Architecture and Building.

"Architectural Drafting." By A. Benton Greenberg, B.A., and Charles B. Howe, M.E. Price 6s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 45, p. 620.)

"Carpentry and Joinery." Fourth Edition. By Banister F. Fletcher, F.R.I.B.A., &c., and H. Phillips Fletcher, F.R.I.B.A. Price 6s. nett. London: Whittaker & Co. (Vol. 45, p. 521.)

"Modern Plumbing Practice." Vol. I.: An Account of Practical Lead-working and Plumbers' Materials. By J. Wright Clarke, M.R.S.I., and Walter Scott, A.R.S.I. Price 10s. nett. London: B. T. Batsford, Limited. (Vol. 46, p. 70.)

Applied Mathematics.

"Applied Mechanics." Vol. I.: Statics and Kinetics. By Charles E. Fuller, S.B., and William A. Johnston, S.B., Professor of Theoretical and Applied Mechanics, Massachusetts Institute of Technology. Price 10s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 46, p. 500.)

"Applied Mechanics and Mechanical Engineering." Vol. V.: The Theory of Machines. By Andrew Jamieson, M.INST.C.E. Price 7s. 6d. nett. London: Charles Griffin & Co., Limited. (Vol. 45 p. 69.)

"Fergusson's Percentage Trigonometry." By J. C. Fergusson, M.INST.C.E. Price 3s. 6d. nett. London: Longmans, Green & Co. (Vol. 46, p. 454.)

"Graphics and Structural Design." By H. D. Hess, M.E. Price 12s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 46, p. 584.)

"Hydraulic Diagrams." Third Edition. By Prof. C. W. L. Alexander, M.SC., &c. Price 2s. 6d. nett. Post free from the Author, University College, Cork. (Vol. 46, p. 140.)

"Hydraulics." By E. H. Sprague, ASSOC.M.INST.C.E. Price 3s. 6d. nett. London: Scott, Greenwood & Son. (Vol. 46, p. 140.)

"Technical Mechanics." By Edward R. Maurer. Price 10s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 45, p. 954.)

Coast Protection.

"Coast Sand Dunes, Sand Spits, and Sand Wastes." By Gerald Case. Price 5s. London: St. Bride's Press, Limited. (Vol. 46, p. 459.)

"The Maintenance of Foreshores." By Ernest Latham, ASSOC.M.INST.C.E. Price 2s. nett. London: Crosby Lockwood & Son. (Vol. 45, p. 365.)

Electricity.

"Continuous and Alternating Current Machinery." By S. H. Morecroft. Price 7s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 46, p. 17.)

"The 'Mechanical World' Electrical Pocket-book for 1914." Price 6d. nett. Manchester: Emmott & Co., Limited. (Vol. 45, p. 251.)

Highways.

"A Glossary of Road Terms." By H. Percy Boulnois, M.INST.C.E., &c. Price 2s. nett. London: St. Bride's Press, Limited. (Vol. 46, p. 281.)

"A Treatise on Roads and Pavements." By Ira Osborn Baker, M.SOC.C.E., Professor of Civil Engineering in the University of Illinois. Second Edition. Price 21s. nett. London: Chapman & Hall. (Vol. 46, p. 106.)

"Bibliography of Roadmaking and Roads in the United Kingdom." By Dorothy Ballen. Price 15s. nett. London: P. S. King & Son. (Vol. 45, p. 251.)

"The Constructions of Roads and Streets." By Henry Law and D. K. Clark, MM.INST.C.E. Revised, with additional chapters, by A. J. Wallis-Tayler, ASSOC.M.INST.C.E., M.S.A. Eighth Edition. Price 6s. London: Crosby Lockwood & Son. (Vol. 45, p. 299.)

Hygiene, Public Health and Sanitation.

"A Handbook of Hygiene." By A. M. Davies, M.R.C.S., &c. Fourth Edition by the Author and C. H. Melville, M.B., C.M. Price 10s. 6d. nett. London: Charles Griffin & Co., Limited. (Vol. 45, p. 251.)

"Handbook on Sanitation." By George M. Price, M.D. Price 6s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 45, p. 29.)

"Practical Sanitation." By George Reid, M.D., D.P.H. Seventeenth Edition. Price 6s. London: Charles Griffin & Co., Limited. (Vol. 45, p. 327.)

"Sanitary Engineering." A practical manual of town drainage and sewage and refuse disposal. By Francis Wood, M.INST.C.E., F.G.S. Price 8s. 6d. nett. London: Charles Griffin & Co., Limited. (Vol. 45, p. 926.)

Legal.

"A Digest of the Law and Practice Relating to Local Government in England and Wales (including London)." By Arthur D. Dean and E. J. Rimmer. Price 5s. nett. London: Butterworth & Co. (Vol. 45, p. 647.)

"An Outline of Local Government and Local Taxation in England and Wales (Excluding London)." By Sir Robert S. Wright and the Right. Hon. Henry Hobhouse. Price 7s. 6d. London: Sweet & Maxwell, Limited. (Vol. 45, p. 365.)

"Local Government, 1913-1914." By A. Macmorran, K.C., and K. M. Macmorran, M.A., LL.B. Price

21s. nett. London: Butterworth & Co., and Shaw & Sons. (Vol. 46, p. 659.)

"Local Legislation, 1913." By Frank Noel Keen, LL.B. Price 10s. nett. London: Walter Southwood & Co. (Vol. 45, p. 647.)

"The Law of Forestry." By Benaiah W. Adkin. Price 8s. 6d. London: Sweet & Maxwell, Limited. (Vol. 46, p. 211.)

"The London Building Acts." By Prof. Banister Fletcher, D.L., F.R.I.B.A. Fifth Edition. Price 10s. nett. London: B. T. Batsford, Limited. (Vol. 46, p. 106.)

"The Public Health Acts." Annotated, with appendices containing the various incorporated Statutes and Orders of the Local Government Board, &c. First Edition, Public Health Act, 1875, by W. G. Lumley, LL.M., Q.C., Counsel to the Local Government Board, and Edmund Lumley, B.A., of the Middle Temple, Barrister-at-law. Eighth Edition. In two volumes. By Alexander Macmorran, M.A., one of His Majesty's Counsel, and Joshua Scholefield, of the Middle Temple and North-Eastern Circuit, Barrister-at-law, assisted by Gerard R. Hill, M.A., of the Inner Temple and North-Eastern Circuit, Barrister-at-law, and Kenneth M. Macmorran, M.A., LL.B., of the Middle Temple and Western Circuit, Barrister-at-law. Price £3 15s. nett. London: Butterworth & Co., and Shaw & Sons. (Vol. 46, p. 425.)

Miscellaneous.

"Electro-Thermal Methods of Iron and Steel Production." By J. B. C. Kershaw, F.I.C. Price 8s. 6d. nett. London: Constable & Co., Limited. (Vol. 45, p. 365.)

"Farm Gas Engines." By C. F. Hirshfeld and T. C. Ulbricht. Price 6s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 45, p. 29.)

"Graphic Methods for Presenting Facts." By Willard C. Brinton. Price 16s. 8d. New York: Engineering Magazine Company. (Vol. 46, p. 726.)

"Investigating an Industry." By William Kent. Price 4s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 45, p. 739.)

"Power and Power Transmission." By E. W. Kerr, M.E. Third Edition. Price 8s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 45, p. 1,067.)

"Practical Illumination." By Justus Eck, M.A., M.I.E.E. Price 1s. nett. London: S. Rentell & Co., Limited. (Vol. 45, p. 954.)

"Screw Propellers and Estimation of Power for Propulsion of Ships." By Captain Charles W. Dyson, United States Navy. Price 31s. 6d. nett (two volumes). London: Chapman & Hall, Limited. (Vol. 45, p. 620.)

"Stanford's Geological Atlas of Great Britain and Ireland." Edited by H. B. Woodward, F.R.S. Third Edition. Price 12s. 6d. nett. London: Edward Stanford, Limited. (Vol. 45, p. 417.)

"Steam Turbines." By J. A. Moyer. Second Edition. Price 15s. nett. London: Chapman & Hall, Limited. (Vol. 45, p. 954.)

"The Garden City." By C. B. Purdom. Price 10s. 6d. nett. London: J. M. Dent & Sons, Limited. (Vol. 45, p. 365.)

"Trout in Lakes and Reservoirs: A Practical Guide to Managing, Stocking and Fishing." By Ernest Phillips. Price 2s. 6d. nett. London: Messrs. Longmans, Green & Co. (Vol. 46, p. 211.)

"Woodworking Machinery: Its Use, Progress and Construction." By M. Powis Bale, M.INST.C.E., M.I.MECH.E. Third Edition. Price 9s. London: Crosby Lockwood & Son. (Vol. 46, p. 659.)

Reinforced Concrete.

"Reinforced-concrete Railway Structures." By J. D. W. Ball, ASSOC.M.INST.C.E. Price 8s. nett. London: Constable & Co., Limited. (Vol. 45, p. 365.)

"Report of the Special Committee on Reinforced Concrete." (The Engineering Society of China.) Shanghai: Kelly & Walsh, Limited. (Vol. 46, p. 599.)

Sewerage and Sewage Disposal.

"Scales for Ascertaining the Dimensions of Pipes, Drains and Sewers." By C. E. Housden. Price 1s. 6d. nett. London: Longmans, Green & Co. (Vol. 46, p. 140.)

"Sewage-drainage Systems." By Isaac Shone, civil, mining and sanitary engineer, M.I.M.E., F.S.I. Price 25s. nett. London: E. & F. N. Spon, Limited. (Vol. 45, p. 251.)

Structural Engineering.

"A Study of the Circular-arc Bow-girder." By A. H. Gibson, D.SC., and E. G. Ritchie, B.SC. Price 10s. 6d. nett. London: Constable & Co., Limited. (Vol. 46, p. 726.)

"History of Bridge Engineering." By Henry Grattan Tyrrell. Price $4. Chicago: Published by the author. (Vol. 46, p. 454.)

"Rapid Earthwork Calculation." By C. E. Housden, late P.W.D., India. With diagrams. Price 1s. 6d. nett. London: Longmans, Green & Co. (Vol. 46, p. 599.)

"The Dock and Harbour Engineer's Reference Book." By Brysson Cunningham, B.E. Price 7s. 6d. nett. London: Charles Griffin & Co., Limited. (Vol. 45, p. 954.)

Surveying.

"Practical Surveying." By Prof. Henry Adams. Price 4s. 6d. London: Macmillan & Co. (Vol. 45, p. 251.)

"Railroad Surveying." By G. W. Pickels and C. C. Wiley. Price 10s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 45, p. 521.)

"Records of the Survey of India." Vol. III., 1911-12. Prepared under the direction of Colonel S. G. Burrard, C.S.I., R.E., Surveyor-General of India. Price Rs.4 (6s.). (Vol. 45, p. 251.)

Town Planning.

"An Introduction to Town Planning." By Julian Julian, B.E. Price 5s. nett. London: Charles Griffin & Co., Limited. (Vol. 46, p. 643.)

Valuation.

"Notes on the Valuation of Real Property." By H. G. Lamputt. Price 1s. 6d. nett. London: Crosby Lockwood & Son. (Vol. 46, p. 140.)

"Valuations and Compensation." By Banister Fletcher, F.R.I.B.A., &c. Fourth Edition, by the Author and H. P. Fletcher, F.R.I.B.A. Price 7s. 6d. nett. London: B. T. Batsford. (Vol. 45, p. 365.)

Water Supply.

"Clean Water and How to Get It." By Allen Hazen. Second Edition; revised and enlarged. Price 6s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 45, p. 647.)

"English, French and German Vocabulary for Water Supply in the Field." By Philip Parker, ASSOC.M. INST.C.E., 25 Victoria-street, S.W. (Vol. 46, p. 689.)

"Modern Methods of Water Purification." By John Don, F.I.C., &c., and John Chisholm, A.M.I.MECH.E. Price 16s. nett. London: Edward Arnold. (Vol. 45, p. 29.)

"Studies in Water Supply." By A. C. Houston, D.SC., M.B., C.M., Director of Water Examination, Metropolitan Water Board. Price 5s. nett. London: Macmillan & Co. (Vol. 45, p. 417.)

"The Microscopy of Drinking Water." By G. C. Whipple. Third Edition; rewritten and enlarged. Price 17s. nett. London: Chapman & Hall, Limited. (Vol. 46, p. 243.)

"Transactions of the Institution of Water Engineers." Vol. XVIII. Edited by Percy Griffith, M.INST.C.E., F.G.S., Secretary. London: St. Bride's Press, Limited. (Vol. 46, p. 70.)

"Water Supplies: Their Purification, Filtration and Sterilisation." By Dr. Eric K. Rideal. Price 7s. 6d. nett. London: Crosby Lockwood & Son. (Vol. 46, p. 613.)

"Waterworks Engineering." By Fred. C. Uren, M.INST.C.E., Ireland Silver Medallist in Civil Engineering, engineer and surveyor, Aldershot Urban District Council. Price 10s. 6d. nett. Bristol: Castle Litho., Limited. (Vol. 46, p. 17.)

Pocket-books.

"Spon's Architects' and Builders' Pocket Price-book." Edited by C. Young, F.R.I.B.A., and S. M. Brooks, L.R.I.B.A. Price 2s. 6d. nett. London: E. & F. N. Spon, Limited. (Vol. 45, p. 454.)

"The Inventor's Adviser and Manufacturer's Handbook of Patents, Designs and Trade Marks." Ninth Edition. By Reginald Haddan. Price 5s. London: Harrison & Sons. (Vol. 45, p. 454.)

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

452. Wells. What are (1) A deep well, (2) a shallow well, (3) an artesian well, and (4) an Abyssinian well? Give definitions. (G. C., *Wigston Magna.*)

453. Building Construction.—Draw a section showing the construction of a flat asphalted roof, carried on timber joists 10 in. by 2½ in., ceiled below, the walls to be of 14 in. brickwork, surmounted by a 9-in. parapet, 2 ft. high, coped with stones, the section to run across the joists and through the parapet walls. ("Ajax.")

454. Foundations.—What should be the composition of concrete for the foundations of a factory chimney-stack? Would lime concrete be suitable? (Ajax.)

455. Testing Materials.—Give an outline sketch of a testing machine for tension tests of steel. (Inquirer.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

451. Hydraulics.—Sketch a practical form of hydraulic ram for raising automatically to a considerable height a portion of any volume of water derived from a lesser height, and explain the points upon which satisfactory working depends.

The hydraulic ram is generally arranged as shown in Fig. 1. The water flows from the stream or tank through a cast-iron pipe, usually called the drive pipe, into the ram (Fig. 2), which is a hollow casting containing two clack valves. The first valve is called the escape or dash valve (D.V.), which opens downwards, and the other the check valve (C.V.), which opens upwards. Over the latter is fixed an air vessel (A.V.), having a delivery or rising pipe (R.P.) fixed to it. If the apparatus be airtight, and the dash valve be compressed, the machine will begin to work automatically, and will continue to do so for a long time. At first the water begins to escape at the dash valve, but the acceleration due to gravity in the drive pipe produces greater pressure on it, and it is suddenly raised to its seat; at the same time the kinetic energy which has been imparted to the water lifts the check valve and forces some of the water into the air vessel. When this energy has been spent the pressure of the air

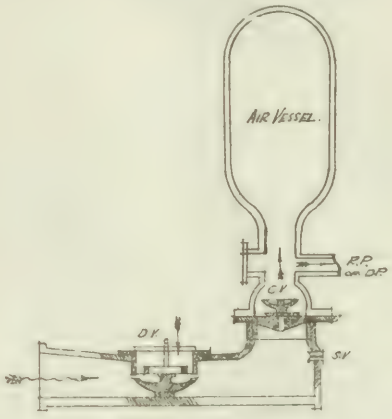


FIG. 2.

and the weight of the check valve cause the latter to close, and immediately the dash valve opens. This series of operations continues automatically, and the air becomes more and more compressed, and gradually forces the water higher and higher up the delivery pipe, until it issues forth as a constant stream from its mouth into the tank or cistern. The air vessel is a very important feature in the machine, as it acts as a cushion and minimises the stress to the casting from "water-hammer," and also acts as a storer of energy, taking up part of the kinetic energy of the water, and giving it out gently, this producing a constant flow through the delivery pipe. The air vessel may be kept charged by a small snifter valve (S.V.) being placed immediately below the check valve. This, in its simplest and most efficient form, con-

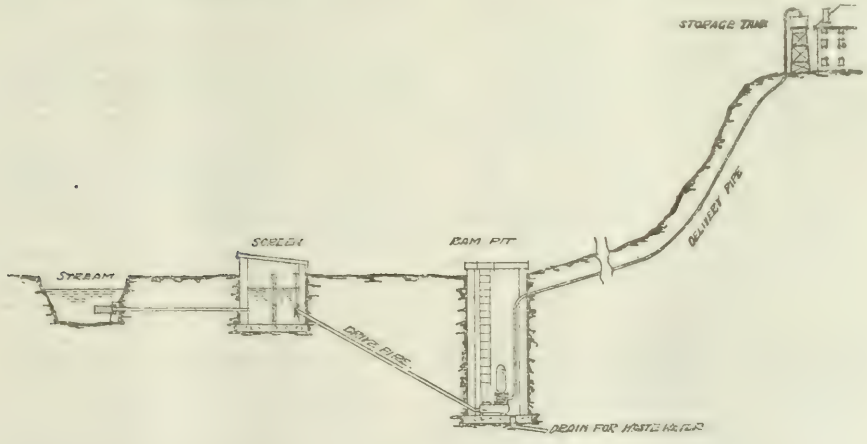


FIG. 1.

sists of a brass plug screwed into the casting, with a very small hole drilled through its axis. Thus every time the water is forced through the check valve a small quantity of air is drawn in, thus keeping the air vessel well supplied. The chief points to be considered for satisfactory working are: (1) The friction of the drive pipe, valves and casting should be as small as possible; (2) the apparatus must be airtight; (3) the valves should be well balanced; (4) the fall from feeding stream or tank to ram should be as much as possible. According to "Molesworth Tables," one-seventh of the water used for driving the ram may be raised to four times the head of the supply, or one-fourteenth to eight times the height, the formula for this being—

$$D = \frac{A \times 4B}{7C}$$

When A = water available for raising
B = vertical height of fall in feet
C = vertical height of delivery in feet
D = quantity raised.

(F. J. M., *Luton.*)

NOTES.

The Specific Gravity and Bushel-weight Tests for Portland Cement.

Specific Gravity.—The determination of the specific gravity of cement is rather difficult, and unless great care is taken the results are liable to be inaccurate. The specific gravity of a powder, like cement, is found by introducing a weighed quantity of the substance into a flask having a known capacity when filled up to a certain mark, and then measuring the volume of liquid necessary to fill the flask up to the mark. In the case of a fine powder the operation is rendered more difficult owing to the tenacious retention of air by the powder, each particle being surrounded by an "atmosphere" of adhering air, and this air is not dislodged at once by immersion in water. It is this that leads to inaccurate results. It is only by very careful shaking and tapping that this air can be made to collect in the form of bubbles and to rise to the surface. Owing to the action of water on cement, it is impossible to use that liquid for the purpose, and its place is taken by paraffin or turpentine, which must be thoroughly dried by standing over quicklime before use. A convenient form of flask for the determination of the specific gravity of cement is shown in Fig. 1. It is broad and flat-bottomed, with a graduated neck. The capacity up

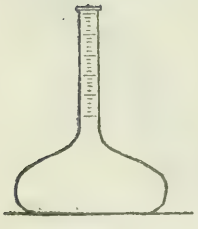


Fig. 1.

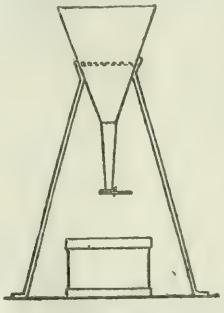


Fig. 2.

to the lowest graduation, which is marked 14, is exactly 64 cubic centimetres. In making a determination 50 cubic centimetres of dry paraffin are introduced by means of a pipette, so as to avoid wetting the neck. Fifty grammes of cement are then weighed out and introduced into the flask through a funnel. After tapping and gently shaking, the level of the liquid meriscus is read off on the graduated neck. The volume of liquid displaced is equal to the volume of cement. All ordinary Portland cements give a reading between 14 and 17 cubic centimetres. The specific gravity is obtained by dividing 50 by the reading, three places of decimals being sufficient accuracy. The practice of introducing the cement first into the flask is not to be recommended, as the air bubbles are much less easily displaced in this way. A minimum value for the specific gravity of Portland cement is usually specified, and in the British Standard Specification it is 3·15 for freshly ground cement and 3·10 for cement known to have been ground at least four weeks. This latter figure is in recognition of the fact that all cements, when exposed to the air, undergo partial hydration and conversion into calcium carbonate at the surface of the particles, which thus become specifically lighter. This combined water and carbon dioxide can be removed by ignition; and it is the practice in some laboratories to make a separate determination of the specific gravity of a sample which has been thoroughly ignited and allowed to cool.

"Bushel-weight" or Apparent Density.—This test at one time generally applied, but has long been deservedly abandoned, as the numerical values obtained were found to be worthless as an indication of the quality of the cement. This was chiefly due to not standardising the conditions. It has been found that the amount of cement that can be put into a bushel measure by vigorous shaking is as much as 70 per cent more than if it is put in as lightly as possible, thus showing the uselessness of the test unless the conditions are standardised. The modern equivalent of the test, which is used in some laboratories, is the "weight per litre," or, as it is sometimes called, "the apparent density" test. A convenient form of apparatus is shown in Fig. 2. The cement is introduced into the conical sheet-metal funnel, which is provided with a perforated disc half way down. The cement is gently stirred, so that it passes through the perforations into a cylindrical brass vessel below, 12·5 centimetres in diameter and 8·15 centimetres high, the capacity of which is one litre. Care should be taken to avoid all shaking of the apparatus during filling. In comparing results, as obtained by this test, it must be borne in mind that the conditions must be identical, otherwise the results are not comparable. The weight of a measured volume of cement determined under standard conditions depends upon the specific gravity and the fineness of grinding, a high specific gravity and a low "litre weight" being a condition indicating fine grinding. (J. A. R., *Faversham.*)

OUR SUFFERING ROADS.

THE EFFECTS OF MILITARY OPERATIONS AND WEATHER.

Military operations and the bad weather combined are laying up in store trouble for the road surveyors in many parts of the United Kingdom. Mechanical transport is by no means alone to blame for the state of the roads in the vicinity of important military camps; thousands of horses are to be found in many counties, and these animals have to be exercised daily. They frequently cannot be exercised on the land, so they are walked or trotted up and down the highways. The extra damage from the tens of thousands of hoofs may easily be noticed by any observant person. More serious, however, than either of the foregoing circumstances of the past few months is the effect of the unprecedentedly rapid temperature variations. Oscillations of temperature have been abnormal of late; the corresponding exceptional contractions and expansions of the road crust have disintegrated metal from binding, and the loose crust under traffic is being damaged to an extent which may, before long, represent a sum running into several million pounds sterling.

We desire (says the *Commercial Motor*) to extend in advance our sympathies to the road surveyors of the United Kingdom for the conditions which lie ahead of them. They are hampered by want of their usual supply of materials, and they are deprived of ordinary resources in regard to labour. They have, furthermore, no redress against the military authorities, who are shielding themselves behind the privileges of the Crown and the funds which are at the disposal of the Road Board. The surveyors have therefore to contemplate the continuance of a period of mental anxiety, knowing full well that the roads in which they take so great a pride are suffering widespread damage by reason of circumstances over which they have no control. Floods in certain areas have added to these anxieties very materially, but we repeat that it is the frequent rapid temperature changes which are likely to prove the worst factor of all. Motorists in this country, who have gradually become accustomed to evidences of steady improvement in road construction and maintenance, will have to look forward, we greatly fear, to a period not only of marking time, but possibly to one of absolute retrogression in respect of surface conditions.

Some Modern Methods of Arch Calculation.*

By EWART S. ANDREWS, B.Sc., M.I.C.E.

The arch is a form of structure which possesses great advantages from the standpoints of beauty and economy, and from the earliest times the arch has been used in all kinds of constructional work. In the present paper arches are not considered at all from the point of view of architectural styles or orders, consideration being restricted to the calculation of the stresses in them.

The arch presents points of considerable difficulty from this point of view, and the resulting formulæ are elaborate. Some may contend that the formulæ are too elaborate, and that "simple practical rules" are just as good. One answer to this contention is that such simple rules would be welcomed if they really were as good. The difficulty is that, unless simple rules are applicable over a wide range, and have been fully tested by scientific experiment, there is considerable danger in their use.

There is, unfortunately, among some practical engineers a strong antipathy to complicated formulæ—an antipathy which is usually stronger in proportion as the formulæ are not understood—but loser acquaintance with such formulæ and some useful spade work in the form of the compilation of tables and diagrams usually helps to dispel much of the dread. The primary reason of the difficulty in the determination of the stresses in arches arises from the fact that in most cases the arch is what is called "a statically 'ndeterminate structure," so that the forces acting upon the arch cannot be found by the ordinary laws of statics. Exactly similar difficulties arise in the case of stiffened suspension bridges, continuous beams, and slabs.

The stresses in an arch can be found as soon as we can find the magnitude and position of the reactions. These reactions R may be considered as compounded of vertical components V and horizontal thrusts H. If, as is usual, all the loads on the arch are vertical, the horizontal thrust H must be the same at each end. We can then draw the line of pressure, linear arch or equilibrium polygon (three alternative names for the same thing) for the given load system upon the arch.

Then, by Eddy's theorem that "the bending moment at any point of an arch is equal to the product of the horizontal thrust into the vertical intercept between the centre line of the arch and the line of pressure," we have—

$$\text{Bending moment at any point P} = \text{H}\,\delta$$

If the line of pressure comes below the centre line of the arch, the upper surface or extrados of the arch will tend to become in tension, and if the line of pressure is above the centre line of the arch, the lower surface, or intrados, of the arch tends to become in tension.

STRESSES IN THE ARCH.

To obtain the stresses in the arch we first find the thrust or normal pressure Q, and the shearing force S, at the point by resolving the thrust O, at the point under consideration along and perpendicular to the centre line of the arch at the given point.

Then, if A is the area of the section, and M_c, M_t the compression and tension moduli, we have—

$$\text{Maximum tension stress} = t = \frac{\text{H}\,\delta}{\text{M}_t} - \frac{\text{Q}}{\text{A}} \quad . \quad (1)$$

$$\text{Maximum compression stress} = c = \frac{\text{H}\,\delta}{\text{M}_c} - \frac{\text{Q}}{\text{A}} \quad . \quad (2)$$

$$\text{Mean shear stress} = s = \frac{\text{S}}{\text{A}} \quad . \quad . \quad (3)$$

There is therefore no difficulty whatever in the calculation of stresses in arches when once we know the horizontal thrust.

Cases in which the horizontal thrust can be found without the elastic theory of arches are as follows:—

(1) Parabolic arch uniformly loaded over whole span—

$$\text{H} = \frac{w\,l^2}{8\,v}$$

w = load per unit length,
l = span of arch,
v = rise of arch.

(2) Parabolic arch with uniform load extending from an abutment to the centre—

$$\text{H} = \frac{w\,l^2}{16\,v}$$

(3) Arch of any shape provided with hinges.—In this case the line of pressure can be drawn by the well-known graphical construction for making a link-polygon pass through any three given points; then the polar distance of the vector diagram gives the horizontal thrust desired.

This theory, to which the author's principal attention was given, is based upon a consideration of the deformations which an arch-rib obeying the ordinary laws of bending will receive. From these deformations we are able to calculate the horizontal thrusts.

Let δs represent a very short length between two points of an arch rib, one end of which is considered as fixed relatively to the other end, and suppose that the bending moment along this very short length is B.

If E is the elastic (Young's modulus), and I the moment of inertia of the rib, it can be shown by the theory of beams that—

Δy = vertical displacement of D due to bending

$$= -\sum \frac{\text{B}\,x\,\delta s}{\text{E}\,\text{I}} \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

Δx = horizontal displacement of D due to bending

$$= -\sum \frac{\text{B}\,y\,\delta s}{\text{E}\,\text{I}} \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

$\Delta \theta$ = angular change of tangent to rib at D

$$= -\sum \frac{\text{B}\,\delta s}{\text{E}\,\text{I}} \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

These are the general formulæ upon which all the special formulæ are based, and it should be noted in passing that they are the deformations due to bending only, and do not include those due to direct thrust. We will refer to the effect of the latter at a later stage.

These general formulæ were then applied to the most common special cases of rigid arches—viz.:—

(1) Arches with two hinges or pin joints—*i.e.*, two-pinned arches.

(2) Arches without hinges—*i.e.*, fixed arches.

In a paper of this kind it was manifestly impossible to deal fully with a subject upon which several long text-books have been written, and it might very well be that many important points have been omitted. The author hoped, however, that a study of the paper would enable those who had not had the opportunity of a complete study of the arch theory in its more general aspects to follow the fundamental relations upon which scientific calculations were based and that their interest would be sufficiently aroused to encourage them to study the subject more fully.

* Abstract of paper read at the last meeting of the Concrete Institute.

Snow Ploughs.—The Patent Snow Plough Company, Mytholmroyd, have recently supplied a number of their 1914 pattern machines to the Government.

Law of Private Street Works.—It is surely a commentary on our system of legislation relating to what may be termed domestic matters that the owner of house property (to say nothing of the occupiers of his houses) has to thread his way through a maze of statutes and decisions to ascertain his rights and his liabilities in connection with questions which may arise every day. Such, however, being the case, text-books dealing with what on the face of them might be deemed to be simple matters have become an actual necessity, although the owner of property is lucky if the text-book suffices and he is not driven to consult a specialist. The work before us* deals with one of such subjects, private street works under the Public Health Acts and the Private Street Works Act, 1882, but not with the Metropolitan Management Acts; the statements in the text are supported by decided cases, with references printed in the text; there is also a table of cases and an index, and it should prove a useful handbook. We find the recent decisions included, and the work seems to have been carefully prepared.—*The Builder.*

* "Notes on the Law of Private Street Works under the Public Health Acts." By J. B. Reignier Conder, a Solicitor of the Supreme Court. 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.

SOME RECENT PUBLICATIONS.*

American Handbook for Electrical Engineers. Edited by Harold Pender. Price 21s. nett. London: Chapman & Hall, Limited.

Inasmuch as this encyclopædic work contains upwards of 2,000 pages, it is well that the temptation to call it a "pocket" book has been avoided. An excellent principle which has been observed throughout is the treatment of theoretical principles in separate articles, so that the engineer desirous of looking up a practical point can always find it easily and without wading through a mass of theoretical discussion. Further, although the handbook is primarily devoted to electrotechnics, articles will be found upon those branches of civil and mechanical engineering which are related to electrical practice. The handbook does not profess to be a treatise, but it is much more than a note-book, so that, although many of the articles are necessarily condensed, they are so complete as in every case to render the information given of the greatest practical value. Ease of reference is an important matter in a work of this character, and this is thoroughly secured by the arrangement of the articles in encyclopædic form, and by the adoption of a uniform plan in the subdivision of the articles themselves. Moreover, each article concludes with a bibliography directing the reader to the sources of more extended information. The book is unique in form and arrangement, and its completeness should assure it a permanent place among the recognised standard works of its class.

Text-book of Mechanics. Vol. V.: Hydraulics. By Louis A. Martin, junr. Price 6s.6d. nett. London: Chapman & Hall, Limited.

This is the fifth volume of Mr. Martin's text-book of mechanics, published in New York by Messrs. John Wiley & Sons. It is designed primarily for use in colleges and technical schools, and is concerned with the fundamental principles underlying the science of hydraulics. The first chapter is devoted to a consideration of liquids at rest, and affords a fitting introduction to the main part of the work. The author has throughout kept in view the applications of the theories developed to practical problems. Moreover, the whole work is copiously sprinkled with exercises and problems, which will be much appreciated by students. Special attention is given to the principles underlying the theory and design of impulse wheels and turbines. The student who conscientiously works through this book will have a thorough grasp of the subject.

Foundations. By Malverd A. Horne. Price 5s. 6d. nett. London: Chapman & Hall, Limited.

The author of this book, which is issued in New York by Messrs. John Wiley & Sons, is Professor of Civil Engineering at the Rose Polytechnic Institute, and his object has been to state in an elementary manner the fundamental principles upon which the proper design of foundations is based, and to arrange the matter in a form suitable for a students' text-book. The first chapter deals with the supporting capacity of soils, while subsequent chapters are respectively devoted to wall and column footings, piles and pile foundations, chimneys and towers, bridge piers and abutments, and the methods employed for difficult foundations. Throughout the work the footing courses of the several structures have been treated separately from the foundations proper. The work is well illustrated, the drawings having been selected from descriptions of actual structures.

Pumping by Compressed Air. By Edmund M. Ivens, M.E. Price 12s. 6d. nett. London: Chapman & Hall, Limited.

This work, intended at once for the student and the operating engineer, forms one of Messrs. Wiley's well-known technical series. The literature on the subject is comparatively meagre, the use of compressed air for pumping purposes only having developed to any extent in recent years. In addition to descriptions of plant and explanations of the scientific principles upon which the various kinds are based, the work contains a lucid account of so much hydraulics and thermo-dynamics as is necessary to a complete understanding of the subject. The book should prove of great value to all who are interested in the matters of which it treats.

The Tithe Rent Charge Table. Showing at a glance the yearly and half-yearly values of any tithe rent charge for the year 1915. By P. W. Millard, LL.B. Price 1s. 1d. post free. London: Shaw & Sons.

This is the seventy-ninth annual issue of these well-known tables, and the fact that they are recommended by the Auctioneers' Institute and the Tithe Rent Charge Owners' Union affords sufficient testimony to their usefulness and reliability. In addition to the tables, the book contains a short summary of the complicated provisions of the numerous Tithe Acts. The whole will be found most useful not only to landowners and tithe owners, but also to all professional men who are interested in the subject.

The "Mechanical World" Electrical Pocket-book for 1915. Price 6d. nett. London: Emmott & Co., Limited.

The present issue of this popular handbook is similar in form to its predecessors. Many of the sections, however, have been considerably extended, and several new features have been introduced. Among the latter may be mentioned sections dealing respectively with electric circuits and switching, and alternating current generator, and motor troubles and their remedies. The book generally has been thoroughly revised, and remains a marvel of excellence and cheapness. Reference is facilitated by a very complete index.

In spite of the disturbance of our normal life caused by the struggle in Europe, the Homeland Association is steadily continuing the publication of its books describing the green fields and pleasant by-ways of England, and has recently issued, after being out of print for many years, a handbook to Dorking, Box Hill, and its beautiful surroundings—a peerless gem of Surrey scenery and environment. The book is published in cloth at 1s., and in paper boards at 6d., and contains a plan of the town and a valuable 1-in. Ordnance Survey map of the surrounding country which will appeal to ramblers.

* Any of the publications reviewed or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

PRO PATRIA.

[NINETEENTH LIST.]

We present herewith the nineteenth list of municipal engineering and sanitary officials who are taking part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

Craddock, A. C. B., second assistant engineer, Shanghai Municipal Council, has volunteered for active service.

Evans, T. R., junior assistant, Shanghai Municipal Council, has volunteered for active service.

Gimson, A. F., surveying assistant, Shanghai Municipal Council, has joined the colours.

Gray, A. T., district inspector, Shanghai Municipal Council, has joined the Army.

Hawthorne, G. S., clerk in the office of the Berks medical officer, private, A Company, 4th Battalion Royal Berks, Chelmsford.

Lewis, J., engineer and surveyor to the Yiewsley Urban District Council, and assistant engineer and surveyor to the Uxbridge Rural and Yiewsley Urban Joint Drainage Board, 2nd Reserve Battalion, City of London Sanitary Company, R.A.M.C., has volunteered for foreign service.

Needham, J. E., chief assistant engineer, Shanghai Municipal Council, has joined the colours.

Pollard, H. E., second assistant engineer, Shanghai Municipal Council, has volunteered for active service.

Salkield, T., city engineer of Delhi, Captain, commanding F Company, 1st Punjab Volunteer Rifles, Delhi.

Scougall, A., district inspector, Shanghai Municipal Council, has joined the Army.

Shorto, M. H., second assistant engineer, Shanghai Municipal Council, has volunteered for active service.

Turner, F. O. R., assistant district inspector, Shanghai Municipal Council, has joined the Army.

There was collected in the city engineer's department, Oxford, and paid over to the various war funds up to the end of the year, the sum of £59 5s. 2d.

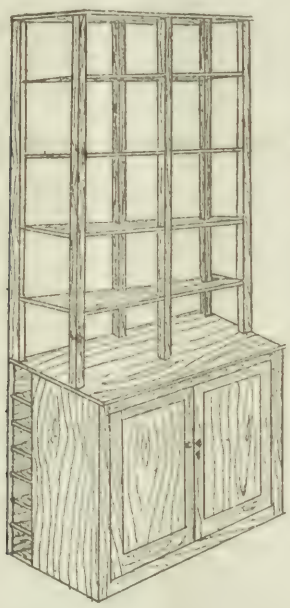
CORRESPONDENCE.

Εἰς ἀνὴρ οὐ πᾶσ' ὁρᾶ
(*One man does not see everything.*)
EURIPIDES.

KIT RACK FOR RED CROSS HOSPITALS.

To the Editor of THE SURVEYOR.

SIR, Several readers of THE SURVEYOR have written me relative to a common objection of owners of premises lent as temporary Red Cross hospitals. The provision of a large quantity of shelving is imperative, but ordinary fixing, bearing in mind that the shelves are temporary, has the objection that considerable damage to walls ensues. I now make a practice of specifying shelves to be framed in nests with 2-in. by 2-in. standards back and front, not further than 3 ft. 6 in. apart; shelves to be either wrought board ⅞ in. in thickness, or 2-in. by 1-in.



wrought battens ledgered together. The upper part of the accompanying sketch will illustrate the idea. The drawing shows a kit rack with lock-up cupboard and pigeon-holes at back to take rifles. If the latter are made 6½ in. square, each will contain four rifles—two pushed in from each end. Convenient sizes for the various parts are: Depth of shelves, 18 in.; distance apart, 18 in.; depth of cupboard, 18 in. plus depth of pigeon-holes; width of whole, 4 ft. 6 in.—Yours, &c.,

G. BERTRAM HARTFREE.

Town Hall,
Alton.
January 25, 1914.

MASSACHUSETTS STATE DEPARTMENT OF HEALTH.

To the Editor of THE SURVEYOR.

SIR,—The English engineers who are familiar with the work of the Massachusetts State Board of Health may be interested to learn that this board has recently been reorganised, and henceforth will be known as the Massachusetts State Department of Health. According to the new arrangement there is a Commissioner of Public Health and a council of six appointed by the governor. The commissioner is *ex-officio* a member of this council. The new officials are Dr. Allan J. McLaughlin, Commissioner of Health, and the council is composed of the following: Prof. Wm. T. Sedgwick, Prof. George C. Whipple, Dr. Milton J. Rosenau, Dr. Wm. J. Gallivan, Dr. David L. Edsall, Dr. Joseph E. Lamoreaux.—Yours, &c.,

G. C. WHIPPLE.

Cambridge, Massachusetts.
January 12, 1915.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

What is the name of the engineer who is responsible for the Egyptian roads? Should he not be delighted to read the following paragraph from the Special Finance issue of the *Times* of the 22nd inst.?—

The Main Roads Department, which was formed towards the end of 1912, has, since its inception, made enormous progress in the work of transforming the old tracks into passable roads for vehicular traffic. It is now possible to cross the Delta in all directions by motor-car from town to town. During 1914 about 50 kilometres of roads were constructed. The intention is gradually to macadamise and tar the surface of all roads—at present they are mainly earth surfaces—and the more severely used portions near towns are being so treated first.

* * * *

Does any inhabitant of London ever remember when London streets and roads were left in such a lamentable condition as obtained after the recent snowfall? Is it a fact that this condition was due to the impossibility of finding labour for sweeping and clearing away the snow? And is this not a proof that, instead of there being any distress in London consequent upon unemployment during the war, the reverse is the case, and that there is considerable difficulty in finding sufficient skilled or unskilled labour? What is going to be done with the huge sums of money which have been subscribed to meet distress if none exists?

* * * *

Why are there not used in London more sweeping machines fixed as trailers to quick-running, self-propelled lorries or wagons? Are not all who have watched these machines agreed that they do their work expeditiously and thoroughly, and that the days of the old horse-drawn street-sweeping machine, so far as the Metropolis is concerned, are numbered? Does not one almost wonder when the day will arrive on which improvements and applications of self-propelled traffic will stop? Do not some of us already realise that some day a horse in the streets will be looked upon as a *rara avis*?

* * * *

Have the critics of the condition of the roads in various parts of the country quite realised the enormous difficulties which the road engineers have had to encounter during the past three or four months? Would they be surprised to hear that we have passed through the most trying meteorological times that have been known for years? Do they realise that, in addition to the heaviest rainfall recorded at this season for many years, the sudden changes of temperature have been violent and unprecedented? When we consider the enormous amount of damage caused to roads by quick changes of temperature, and that, in addition to this, there has been abnormal military traffic on most of our roads, should we not be filled with admiration of the men who have risen to the occasion, and have succeeded in keeping our roads from utter destruction?

* * * *

Does not the complaint of the Haslemere surveyor—reported in last week's issue—that he "suffered from being competent," remind one of the story of Napoleon Bonaparte when he rebuked a young and enthusiastic officer with the words, "Trop de zèle, jeune homme, trop de zèle"? Is it not a rather curious coincidence, however, that in the same issue there should have been a short account of a meeting of engineers in America at which Mr. Morris Cooke, director of the Public Works Department of Philadelphia, expressed the view that a municipal engineer should possess the qualification of "a genuine spirit of public service"? Is it not lamentable that, with some municipal authorities, this spirit is looked upon with some disfavour?

* * * *

Who was the learned counsel who, not very long ago, addressed the judge in the following manner with regard to some clause in a well-known Act of Parliament: "My lord, do not hold me responsible for the ignorance of the underpaid departmental official who originally drafted the clause, nor for the overpaid Members of Parliament who, fancying themselves legislators, proceeded to maul the clause in Committee; you and I, my lord, could have done better if the clause had been left to us." Could not this be said of a large number of our Acts of Parlia-

ment, which are often framed with speed and muddled at leisure?

* * * *

Would it not be interesting to know if any of the three bridges which it is proposed to erect over the Thames are to be "toll" bridges, or are they to be free? And what weights will they be designed to carry? Is there not some suspicion that, in the Bill under which powers are to be sought to carry out the work, there are to be inserted clauses which will give the Thames Conservancy Board powers to obtain a revenue from these bridges? If they are not to be free to all classes of traffic, will not the public strongly object to the proposals?

THE SCIENCE OF HEALTH.*

By P. C. Cowan, D.Sc., M.Inst.C.E.,
Chief Engineering Inspector to the Local Government Board for Ireland.

Notwithstanding the great progress made in the sphere of hygiene, especially since the beginning of the Victorian era, it is still necessary to secure, to a much greater extent than hitherto, the individual and personal care of health by the mass of the people. Legislators and sanitarians have already done their part to an extent which might prove sufficient if public opinion were as well informed and zealous as it ought to be with respect to the conservation of the greatest national asset, the good health of the people. That must always largely, if not mainly, depend on the habits and efforts of individuals, and until a widespread interest in sanitation is secured the great code of Public Health and Sanitary Acts will remain to a great extent as dead letters, bringing condemnation instead of deliverance.

For satisfactory civilised life, in addition to the primary essentials of pure air, pure water, and a pure soil, suitable shelter, clothing, and good food are necessary, and should be obtainable by an amount of labour which does not unduly stress the individual. Let us briefly consider how far the conditions of life of the poorer classes in our cities fall short of those moderate requirements.

The general question of the health of towns was investigated by the Poor Law Commissioners of 1839-1842, and they found that the diseases principally prevailing among the working classes were due to accumulations of decomposing refuse, to damp and overcrowded dwellings, and to improper water supply. Yet to-day a very large proportion of the people are housed in slums where the soil and air are necessarily impure on account of the want of space, the impossibility of free access to sunlight and the breeze, the careless habits of the people, and the neglect of scavenging. Whether this is due to poverty, ignorance, or intemperance, or, what is more probable, to all three combined, it is the clear duty of the community to effect a radical improvement. Every adult inhales about 400 cub. ft. of air per twenty-four hours, and sanitary science has clearly shown how vitally important it is that the supply of air should be pure, and how fatal are the effects when it is contaminated. With our modern hygienic knowledge, and especially that part of it relating to the spread of disease by flies or other insects, it is little short of criminal to allow refuse and manure to be stored in our towns, to allow private slaughter-houses, filthy stables and piggeries, and dusty or muddy streets near dwellings.

Our grandfathers could plead that they were ignorant of the vital importance of light and air, but how can we excuse ourselves when we consider the kind of air supply in which the poorer classes in our towns are compelled to exist? They have to breathe a contaminated atmosphere in small rooms of old and decaying buildings, situated in narrow and dirty streets, lanes, and courts, with the soil under and around them permeated and reeking with foul organic matter. In the old quarters of our towns the malign influences of ground air and fluctuations in the level of ground water in a polluted soil are, as a rule, absolutely disregarded. Filth is one of the prime factors in the production and propagation of most of the devastating diseases known to mankind. There are doubtless many unsolved problems regarding the origin and means of communication of disease, but there can be no doubt that cleanliness is a most vital requirement in all our dwellings. . . . There is a crying need for more facilities for the washing of clothes and for bathing among the poor.

Pure air and pure soil cannot be secured where the poor dwell, so long as the sanitary arrangements provided are used by members of more than one family. In one of our great cities, however, a scale of one water-closet to every ten inhabitants over ten years of age is deemed sufficient, and the fact that females cannot possibly use these conveniences is accepted with equanimity. In another city I found a hollow square of about sixteen houses to which a similar number of uncovered ashpits were attached, nearly filling the whole common space behind the houses. Such conditions ought not to be tolerated in any so-called civilised community. The cost of removing them and providing accommodation for all classes where people who wish to live in a cleanly manner can do so will be great, but it must be faced. It would not be a profitless expenditure, but almost certainly, if all the contingent savings are reckoned, quite the contrary. The working classes have been very patient and long-suffering, but they are beginning to voice their social demands. Is their request for the primary necessities of healthy life—a decent shelter, means for keeping themselves clean and healthy, fresh air and sunlight, if not for themselves at least for their children, to be denied them longer?

* Extracts from presidential address to the Engineering and Scientific Association of Scotland.

NOTTS COUNTY SURVEYOR'S RESIGNATION.

The Highways Committee of the Notts County Council on Tuesday last submitted to the council a report recommending the acceptance of the resignation of Mr. E. Purnell Hooley, county surveyor, who, as already stated in The Surveyor, is performing military duties. The committee suggested that Mr. J. C. Haller, the engineering assistant, be appointed to perform the duties of acting county surveyor until the office is filled. The committee further recommended that Mr. Hooley be paid his full salary as county surveyor until he relinquishes the appointment at the expiration of his three months' notice, and that a successor be advertised for at a salary of £750 per year and travelling expenses. [The advertisement appears elsewhere in this issue.]

Colonel H. Denison, in moving the adoption of the report, made allusion to the valuable services rendered by Mr. Hooley in bringing the roads of the county to the highest state of efficiency almost before other counties attempted to improve theirs. They also had to thank him very much indeed for giving Nottinghamshire the benefit of his practical invention of Tarmac without receiving any pecuniary advantage himself so far as this county was concerned. Colonel Denison referred to the enormous expense incurred in consequence of the heavy and fast traction, mentioning that in six months £2,000 damage was done to the roads. As a result of the Tarmac centre, however, a repetition of that trouble had been obviated to a great extent. Mr. Hooley had now joined the 8th Battalion Sherwood Foresters, and, to their regret, was determined to resign, though he expressed his willingness to assist Mr. Haller as much as possible during the ensuing three months.

Mr. C. Mason, in seconding, stated that Mr. Hooley had rendered eminent services to the county during the past twenty-five years, and added that authorities outside Nottinghamshire valued his opinions most highly.

Lord Galway said that Mr. Hooley had accomplished excellent work in connection with the county roads.

Mr. Hooley said he was very grateful to the members of the council for their kindness and help during the past twenty-five years. No one felt the wrench of parting more than he did, but he felt it his duty to do as he had done, and made that his excuse.

Steel Piling for Tanks.—Waterworks and sewerage engineers will be interested in the system of the Side Groove Steel Piling Supply Company, Limited, 16 Water-lane, Great Tower-street, London, E.C., for constructing storage or septic tanks. By the firm's method, the steel piling, instead of timber, is driven to support the sides of the excavation, and, without removal, forms the tank, being rendered on the inside with concrete. The adoption of the system reduces the amount of excavation, and there is no withdrawing of timber shorings, in addition to which no refilling and ramming of the soil around the tank is required.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 57 Moorgate-street, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in* BLACK *ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.*

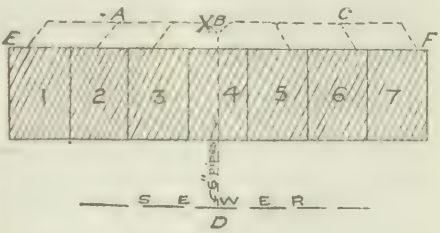
QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as nome de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

WATER SUPPLY WATER FOR TRADE PURPOSES.—"Stoke" writes: In view of the decision in 1913 of *Metropolitan Water Board* v. *Avery*, that a supply to a public-house (even if a large catering business is carried on) is a supply taken for "domestic purposes," and that, in consequence, the supply need not be taken by meter, I should be glad of your opinion in the following cases: (1) Is the decision above binding on all local authorities supplying water? (2) If a stable is attached to the public-house, and a horse and van are kept for delivery purposes, can a meter be then enforced? (3) If a considerable number of horses and conveyances are stabled at a daily charge, can a meter be then enforced? (4) Is water supplied to the following businesses used for "trade purposes": Butcher, where slaughtering is carried on? Baker and confectioner? Factories, where water is used only for cleaning and sanitary purposes? Photographer? Schools? (5) How far can "Regulations" framed by a local authority as to the method of supply, fittings to be used, charges to be made, kind of meters to be used, &c., be legally enforced? Do "Regulations" require confirmation by the Local Government Board, as in the case of building by-laws? The local authority are giving a supply under the Public Health Acts, and have no special private Acts.

(1) The decision referred to was under the Metropolitan Water Board (Charges) Act, 1907, but it would, no doubt, apply to local authorities supplying water under the powers of the Public Health Act, 1875, and the incorporated sections of the Waterworks Clauses Acts, 1847 and 1863. It would also apply to a local authority supplying water under a special Act, unless there was something in that Act which would render the decision inapplicable. The question did not arise in *Metropolitan Water Board* v. *Avery*. But the *ratione decidendi* of that case was that in determining what are "domestic purposes," what has to be looked at is the character of the *purpose* for which the water is used, and not the character of the *premises* in which it is used, and that it is *trade use* of water, and not *increase* caused by the trade use of water, which is put in force by s. 5 of the Act of 1907 outside of domestic purposes. The supply of water to a stable attached to a dwelling-house has been held to be a supply for "domestic purposes" *Bradley* v. *Chesterfield Waterworks Company*, 22 J.P., 689. This case was decided before the passing of the Waterworks Clauses Act, 1863, sec. 12 of which provides that "domestic purposes" shall not include a supply for horses or carriages where they are kept for sale or hire or by a common carrier, or a supply for any trade, manufacture or business. The effect of this section would appear to be that a supply for horses and carriages is a supply for "domestic purposes," except (*a*) where they are kept for sale or hire or by a common carrier, and (*b*) where the circumstances are such that the supply is a supply for a trade, manufacture or business. Applying the principle laid down in *Avery's* case, I think it follows that unless the horse and van are used *solely* for the purpose of the business, the supply would be one for "domestic purposes," and a meter could not be required. (3) If the occupier keeps a horse and carriage which is not used solely for business purposes, he would be entitled to a supply at the domestic rate, and in that case the increased use of water caused by the stabling of horses and conveyances at a daily charge would not, I think, having regard to *Avery's* case, prevent the supply from still being a supply for "domestic purposes." (4) *Butcher.*—The use of water in connection with slaughtering would appear to be an "increase, caused by trade, of domestic use of water," and hence not to be outside "domestic purposes." *Baker and Confectioner.*—The same would, I think, hold good with regard to this business. *Factories.*—A supply to gasworks for sanitary conveniences has been held to be a supply for "domestic purposes" (*South Suburban Gas Company* v. *Metropolitan Water Board*, 1909, 2 Ch., 666); and a supply to a factory for drinking and washing, and closets for the workmen, is a supply for "domestic purposes" (*Colley's Patents, Limited*, v. *Metropolitan Water Board*, 1912, A.C., 24). *Photographer.*—An increase, due to this trade, of the domestic use of water would not prevent the supply from being one for "domestic purposes." *Schools.*—It has been held that the keeping of a boarding school in which water is used for domestic purposes is not carrying on a business for which water is required (*Fredegesilv Bognor Water Company*, 1909, 1 Ch., 149). But a supply of water to a swimming bath at a school is not a supply for "domestic purposes" (*Barnard Castle Urban District Council* v. *Wilson*, 1902, 2 Ch., 746). (5) District councils have no power to make regulations with respect to water supply enforceable by penalties, but they have certain powers under secs. 48, 49, 50, and 54-60 of the Act of 1847, and secs. 16 to 20 of the Act of 1863. The Local Government Board have suggested that councils might draw up "regulations" consisting of an abstract of, or a series of extracts from, these provisions, with a description of the fittings which, in their opinion, would satisfy the requirements of the Acts. No confirmation of such "regulations" by the Local Government Board is necessary, and the board have no power to give such confirmation (Lumley's "Public Health Acts," 8th edition, p. 130).

COMBINED DRAINAGE: SINGLE PRIVATE DRAIN.—"Veras" writes: It is the custom in this city to allow a number of houses to connect to the public sewer by one connection. The enclosed diagram shows seven houses, the drainage from which all discharges by means of the pipes under house No. 4



into the sewer. The pipes taking the drainage of houses Nos. 1 to 3 get choked periodically at the point marked X. All four (1 to 4) belong to different owners. Please say whether these pipes are a sewer or a drain under sec. 19 of the Public Health Acts Amendment Act, 1890, which has been adopted by my council. It is stated that the cause of the trouble is broken pipes, but the council have no proof of this.

I assume that the houses do not all belong to the same owner, otherwise the section does not apply. In *Jackson* v. *Warwick Union Drainage Board* (1904, 2 K.B., 339) sixteen houses were drained by a combined system somewhat similar to that in this case, except that the pipe corresponding with B D on the plan was in a passage between the twelfth and thirteenth house (counting from right to left). The twelve houses to the right of the passage belonged to the plaintiff, the thirteenth house (being the first to the left of the passage) to another owner, and the remaining three houses to a third owner. It was admitted that the pipe at the back of the last four houses—*i.e.*, those to the left of the passage—and the pipe corresponding to B D constituted a "single private drain," these four houses belonging to different owners; but it was held by the Court of Appeal that the pipe at the back of the other twelve houses (all belonging to the plaintiff) was a "sewer." According to this decision, therefore, it would appear that B D would be a "single private drain," and that whether the pipes at the back are "single private drains" or "sewers" would depend upon whether the houses drained by them respectively belong to different owners. But the subsequent decision of the House of Lords in *Wood Green Urban District Council* v. *Joseph* (1907, 1 K.B., 182) has upset all preconceived ideas on this subject, the House having held that sec. 19 of the Act of 1890 applies only to drains which owners can be compelled to provide under sec. 23 or sec. 25 of the Public Health Act, 1875. It seems clear that the local authority could not have compelled the owners to provide either A B C or B D under either of these sections. Therefore it would appear that the whole system (except the portions E A and F C, each of which drains only one house) is a "sewer."

SURVEYOR TO RURAL DISTRICT COUNCIL: REMUNERATION FOR EXTRA SERVICES.—"R. O. S." writes: In this district, as in many others, the roads are being very much damaged by excessive military traffic. I have now received a requisition from the military authorities directing me immediately to repair certain lengths of road, the cost of such repairs to be borne by the Road Board. I have duly forwarded my estimate for the repairs to the Road Board, and have added a certain percentage for supervision and establishment charges, which percentage, I understand, the Road Board are allowing the various councils as extra remuneration for their surveyors owing to the extra work. I am a whole-time officer; my council, however, are anxious for me to undertake the work, and are quite willing to hand over to me the total sum they receive from the Road Board for supervision and establishment charges. As I understand it is illegal

for a surveyor to be paid on percentage on the outlay, would you kindly let me know how the council can overcome the difficulty, it not being possible to fix a certain sum as extra salary, as the amount received from the Road Board will vary according to the amount expended, and in all probability further requisitions for other roads will be received shortly? Would it be possible for the council to pass a resolution that the surveyor's salary be increased by the total amount received from the Road Board for supervision and establishment charges, or would it be necessary, in order to satisfy the auditor, to specify the amount of increase?

The law with respect to the remuneration of surveyors to district councils for extra work is in a very vague and unsatisfactory condition. The only thing that seems certain is that payment by way of percentage on a contract price is illegal by reason of its causing the surveyor to be "interested" in a contract, within the meaning of sec. 193 of the Public Health Act, 1875. The Local Government Board have suggested that the object may be attained by an increase of salary for a specified period; but they have expressed the opinion that the period for which the increase is awarded must be prospective—*i.e.*, it must commence not sooner than the date of the resolution awarding the increase. I am afraid such a resolution as that suggested in the query would not get over the difficulty in this case, as it would probably be held to give the surveyor an "interest" in the contract with the Road Board within the meaning of the Act. I think the only safe plan would be to ascertain the probable amount to be received from the Road Board as nearly as possible, and vote an increase of salary of a specified sum of about that amount in advance. It would also be advisable to obtain the Local Government Board's approval of the proposal beforehand, so as to avoid difficulties with the auditor.

IMPROVEMENT SCHEME: UNHEALTHY AREA.—"Layout" writes: An insanitary area, with other neighbouring lands, are included in an improvement scheme, which is to be executed under the Housing Acts, 1890 (Part I.)—1909. The scheme includes the demolition of slum property, culverting of river, laying out of area with new roads, and erecting working-class dwellings on half the area. In the list of Local Government Board instructions issued in June, 1910, among other particulars required are two copies of the estimate of carrying the scheme into effect. Under sec. 25 of the Housing of the Working Classes Act, 1890, a local authority may borrow money required under the Act; under sub-sec. 4 an urban authority have the same power as given by the Public Health Acts for defraying expenses incurred. (1) Is the estimate to be a detailed one of the complete scheme? (2) Is a definite amount of housing to be included in this estimate when no other houses are available? (3) What is the proportion allowed of those displaced? (4) Has any temporary provision to be made for those displaced at the commencement of the scheme? (5) Does the confirming order give the authority borrowing powers for the amount included in the scheme, or has the authority to apply again separately for sanction to borrow, as the various works are proposed to be executed? (6) Is separate sanction only required in case of additions to the confirmed scheme not elaborated in the latter? (7) Are the plans of the scheme to be complete working drawings as proposed to be carried out, or on the lines of those prepared for a Provisional Order confirmed by Parliament?

(1) Presumably the estimate should give such details as may be necessary to show how it is arrived at. (2, 3 and 4) Neither the Act nor the rules give these particulars. Apparently it is left to the local authority to provide for them in the scheme, or in such manner as they think advisable, and the Local Government Board have power under sec. 8 (5) of the Act of 1890 to make such modifications in the scheme as they think fit. (5 and 6) There does not appear to be any provision for the consent of the Local Government Board to the exercise of borrowing powers being included in the Confirmation Order. Presumably a separate application has to be made for such consent. (7) As the rules do not specifically state that complete working drawings must be furnished, it may, I think, be inferred that they are not necessary.

DAMAGE BY FLOODING.—"L. C." writes: A rural district council have sewered a village within their area, and excluded surface water from the system. Some twelve months ago a house which connected to the main sewer was flooded at the back owing to a large amount of surface water finding its way into the sewers and rendering these incapable of doing their work. The circumstances were investigated, and it was found that the overflow from a large pond was running down to the back of some cottages, and getting into the sewer by the gully traps and manholes; also another block of cottage gardens were being flooded from surface water coming off the high land adjoining. This water was getting to the sewers by means of manhole covers. The rural district council requested the owner of the pond and the high land adjoining the above-mentioned cottages to abate the flooding of the sewers. He complied in the case of the pond by putting in a relief overflow drain, and in the second case by laying a surface-water drain to try and divert water from the high land. No nuisance has since been experienced until a few days ago, when the same house was badly flooded, and damage done to contents of the rooms. It appears that the owner of the pond had instructed his tenant to cleanse it, and the water had been drawn off by means of a hatch. This had been left open, and during a heavy rain the whole of the water had gone through the hatch down the same course as it formerly did before the overflow drain was put in. Hence the same flooding took place. It was also found that water from the high land abutting the second lot of cottages had again flooded the gardens, and had got into the sewers. (1) Is the owner of the pond liable for any damage done in flooded houses? (2) Or is the local authority liable as the sanitary authority? (3) If the tenant claims, should he proceed against the local authority or the owner of the pond?

Assuming that this is a natural pond, and that the landowner has not used the pond or the land in any exceptional or extraordinary manner calculated to cause flooding, and that there has been no negligence on his part, he is not liable, in my opinion, for the damage. Neither, I think, is the local authority liable, in the absence of any negligence on their part.

WATER SUPPLY: MAINS IN NEW STREETS: EXTRAORDINARY TRAFFIC.—"Ravensbury" writes: (1) A new building estate has been developed in an urban district for the erection of workmen's cottages, certain new roads having been laid out on the estate. The local authority who own the waterworks have an existing water main in the public highway at the commencement of the new roads. The society who are building the cottages have applied to the council for a supply of water, and are of opinion that it is the duty of the authority to lay the necessary mains in the new roads, and at the expense of the ratepayers. I should be glad if you would inform me if the council are liable to do this work, or if the laying of the water mains on the new building estate devolves upon the person laying out such estate. (2) The haulage of bricks for the erection of the cottages has been by tractor, and considerable damage has been done to a lane which has recently, by the laying out of new streets, become a thoroughfare. The tractor traffic in connection with the haulage of these bricks is out of all proportion to the usual amount of tractor traffic carried by the lane. The society contend that, in so far as this was not through traffic, they are not liable for damage done to the highway.

(1) There appears to be nothing in the Public Health Act, 1875, or in the Waterworks Clauses Acts, which obliges the council to lay mains in any particular street or streets. A water company or authority whose special Act incorporates the Waterworks Clauses Act, 1847, can be compelled, under sec. 35 of that Act, to lay down mains in every part of their district if the water rates will not be less than one-tenth of the cost. But this section is not incorporated in the Public Health Act, and therefore does not apply to local authorities supplying water under the powers given by that Act. The cost of works necessary to furnish a supply to houses can be recovered from the owners, or declared to be private improvement expenses, under sec. 62 of the Public Health Act, subject to the conditions mentioned in that section. This provision applies apparently whether mains have been laid in the street or not; but if required to obtain a supply from an unreasonable distance the owners would have a right of appeal to the Local Government Board. *West Lancashire Rural District Council* v. *Ogilvy*, 1899, 1 Q.B., 377). (2) I think there can be no doubt that this is "extraordinary traffic," and I do not appreciate the society's contention. The parties "by or in consequence of whose order" the traffic was conducted would, in my opinion, be liable for expenses incurred by reason of the damage arising from the traffic.

BUILDING LINE. "Snowdon" writes: "Some time ago my council passed plans for the erection of four cottages on a site then occupied by a similar number of very dilapidated ones. The building line was defined some 10 ft. back from the front wall of the then existing cottages, this being the line of the buildings immediately above. The owners offered to throw this land into the street if the council would make up the roadway and put a footpath along the frontage. This was agreed to by letter, but no actual agreement was signed. The cottages are now being completed. The floor line has been set some considerable height above the street, and the construction is such that a step outside the building line is necessary. No such step was shown on the deposited plans. This the council will not allow, and the owners have been so informed. Their reply has been a refusal to give up the land, and they are utilising the old cottage walls to enclose the site, and propose to obtain access by means of a sloping path from the street across this area, steps being

The Surveyor
And Municipal and County Engineer.

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formed in the centre line wall of Can the Co. be [illegible] the land be extended? (2) It not, can the council right in contracting that the old cottage walls now being used to enclose the site and the [illegible] thereon are to be [illegible] the new cottages and that the erection and building forward beyond the defined building line is an offence against sec. 3 of the Public Health (Building in Streets) Act, 1888.

(1) This depends upon whether the correspondence is such as to amount to a binding contract for the purchase of the land by the council, and the question cannot be satisfactorily answered without seeing a copy of the correspondence. (2) The Act of 1888 is to be construed as one with the Public Health Act, 1875, and sec. 150 of the latter Act provides *inter alia* that the re-erecting of any building pulled down to or below the ground floor shall be considered as the erection of a new building. If, therefore, the cottages have been pulled down to or below the ground floor, the re-erection of their front main wall beyond the front main wall of the house or building on either side thereof, in the same street, without the consent of the council, would be a contravention of sec. 3 of the Act of 1888.

ACCIDENT TO SANITARY INSPECTOR.—"W. J." writes: A is a sanitary inspector to a rural district council, and is paid £200 per annum. He has to provide his own means of locomotion (no special method suggested by the council), and uses a motor cycle. He is insured by the council. While travelling to a village for the purpose of disinfecting a room he overtook two cyclists, who, as it turned out, were not efficient riders. As he was almost on the point of passing them one of them swerved, and in trying to avoid a collision A ran into a wall, injuring himself and the machine. After being in the doctor's hands about three weeks an operation was suggested, and it was evident that it would be some time before [illegible] is not entitled to full salary. Are the council justified [illegible] but the question of additional assistance had already [illegible] give enough time to inspection under the Housing and [illegible] Act, and proposed [illegible] council that the assistant would ride a cycle, but, [illegible] they have authorised the hiring of a motor cycle for long journeys. A's motor cycle is his own property.

In my opinion the council are liable to pay a full salary [illegible] to sue for the salary when due.

[illegible] "G. W." writes: I am forwarding a copy of my council's building by-laws, and would be very pleased to have your opinion as to whether the construction of party gable walls in domestic dwellings with cavity concrete blocks, is permissible or not; also what would be a sound objection to the construction of the said party walls with concrete blocks having a 2-in. cavity?

[illegible] structed of hollow blocks of cement concrete, subject to the [illegible] (including cavity) to be not less than 9 in., substance at [illegible] with [illegible]

Sec. 150 of the Public Health Act, 1875, provides that the [illegible] ground floor shall be considered the erection of a new [illegible] of a new [illegible] rebuilding of the cottage is the erection of a new building, within the meaning of the by-laws, and that plans must be submitted.

We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

County Councils and Hospitals. Speaking at a meeting of the Executive Council of the County Councils Association held at the Westminster Guildhall on Wednesday, Mr. Herbert Samuel, President of the Local Government Board, said [illegible] that in the near future the trend of legislation would be to give county councils larger powers with respect to the provision of hospital accommodation.

The War and Rural Housing.—Some rural districts who had undertaken housing schemes have been constrained to postpone them because of the feeling of uncertainty created by the war, combined with the rise in the rate of interest on loans and the increased cost of building. The Rural Housing Association, of which Sir Thomas Dyke Acland is president, has addressed to district councils a circular urging them not to pursue the [illegible] delay.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Birmingham T.C. (January 14th. Mr. M. K. North).—£2,190 for the purchase of property at the corner of Bristol-street and Great Colmore-street, for the purposes of a police station.—The town clerk, Mr. E. V. Hiley, stated that four houses stood on the site, and it was not proposed at present to construct a new police station, but to alter some of the rooms of the existing houses to render them suitable for the use of an inspector and to provide quarters for a few single men; also to construct two or three cells for the temporary accommodation of prisoners.

Chesterfield T.C. (January 26th. Mr. W. O. E. Meade-King).—£7,020 for the purpose of carrying out a sanitary conversion scheme.—It was stated that of the 3,724 middens in the borough, 916 had been dealt with by the corporation at the expense of the owners, leaving 2,808 to be dealt with. It was computed that on an average each conversion would cost £5, and the owners would be called upon under the Public Health Act to pay half the cost. The scheme was to be completed by March 21, 1920.

Hursley R.D.C. (January 13th. Mr. F. O. Stanford).—This was an inquiry into the application of the council to put into force the Land Clauses Act in regard to the purchase of land needed as an outfall site for the drainage of Chandler's Ford. The land in question, situate not far from the isolation hospital, is owned by Mr. J. E. Willis Fleming, the tenant being Mr. J. R. G. Fowle. It was stated that an inquiry had been held previously into the proposed drainage scheme, which the council were requested to proceed with. The various owners agreed concerning the notices served on them, but the council were unable to obtain by private treaty the land owned by Mr. Fleming, and required by the council for drainage purposes. Hence the proposal to put into force the Land Clauses Act in regard to it. The engineer for the scheme, Mr. A. H. Brain, stated that he had examined other sites in the village, but none were so suitable for outfall works as the one proposed, this being the only site where part of the district could be drained by gravitation.

Kidderminster T.C. (January 21st. Mr. F. O. Stanford). £31,000 for works of sewerage and sewage disposal.—The town clerk, Mr. J. H. Thorfield, stated that £7,765 was required for sewering the areas recently added to the borough, £6,000 for new pumping plant, and the remainder for storm water tanks, rising main, sedimentation tanks, and under-drainage on the farm. The Local Government Board had assented to a loan of £13,500 for the purchase of additional land at the farm, and that purchase had been completed. It was agreed with the Worcestershire County Council, when Kidderminster Borough was extended, that certain land on the farm should not be used for irrigation purposes in order to minimise any nuisance to Stourport, and that sedimentation tanks should be put on the farm, and it was to carry out this agreement that the present proposal was made. At the request of the Local Government Board the engineer to the corporation, Messrs. Willcox & Raikes, had reported upon the alternatives of treating the sewage bacteriologically or by broad irrigation, and, while reporting that either system could be adopted, advised [illegible] on the land method. The [illegible] was adopted by the corporation.

Maldens and Coombe U.D.C. (January 22nd. Mr. M. K. North). £13,000 for the making up of part of South Lane, under the Private Street Works Act, and £6,000 for the compulsory purchase of certain property.—Mr. R. H. Jeffes, the surveyor to the council, explained the plans. There was considerable opposition to the former scheme, one of the chief frontagers being represented by [illegible] (Mr. Barrington Ward) and by the surveyor (Mr. T. R. Terry).

Manchester T.C. (January 26th. Mr. F. H. Tulloch). £14,570 for private street improvements.—The scheme referred to proposed to make up roads on the southern side of the city. The Parks Committee have announced their intention to plant trees on the footpaths on [illegible] when the proposed improvements have been made.

Newry T.C. (January 12th. Dr. J. McCormack). £400 for the erection of an isolation hospital at Reach Island, Fathom, on the shores of Carlingford Lough.—There was strong opposition to the scheme on behalf of the local oyster fishermen and oyster-bed owners.

Preston T.C. (January 15th. Mr. F. H. Tulloch). —£3,800 for the provision of a park and recreation ground near Newhall-lane, Preston.—It was stated that a portion of the ground it was proposed to purchase had been used as a recreation ground since 1902. This land, amounting to over 9 acres, had been leased to the corporation at a rent of £50, with an option of purchase. The corporation proposed to extend it by the purchase of an adjoining piece of land, and the money they sought to borrow would be expended as follows: Purchase of present ground, £1,940; additional land, £1,160; and laying out of the land, to include two bowling greens and bowl house, £700. The borough surveyor, Mr. T. Cookson, submitted details of the proposed works.

Skelmersdale U.D.C. (January 22nd. Mr. R. S. Maxwell).—This was an inquiry with respect to an application for a Provisional Order to enable the council to borrow money for sewerage and sewage disposal works on the security of bonds valued at £17,500 in the Southport, Birkdale, and West Lancashire Water Board.—The clerk to the council, Mr. A. Dickinson, said that some years ago the council's waterworks undertaking was sold to the water board for the sum of £22,500, £5,000 of which was paid over to the council, and the sum of £17,500 was invested in the bonds of the water board, and was so secured that they were only redeemable at the expiration of a period of thirty years. By Act of Parliament the council were prevented from raising money on the security of these bonds, and a Provisional Order was necessary to enable them to do so, the council requiring the sum of £12,200 to carry out a proposed sewerage scheme. The council were entirely free from debt. At the close of the inquiry the inspector congratulated the township of Skelmersdale on the unique position of having no loans and being free from debt, and also stated that they were exceedingly fortunate in having such a large amount of money (£17,500) in hand. He knew of no other township in such a happy position.

Tipperary U.D.C. (January 12th. Mr. G. B. Deane).—£23,000 for the erection of 129 working-class houses. Opposition was offered in the case of the sites on the Barrymore estate.

APPLICATIONS FOR LOANS.

Ashton T.C. £20,000 for a new secondary school.

Bromley T.C. £937 for road widening.

Bedwas and Machen U.D.C.—£2,150 for water mains extensions.

Cleethorpes U.D.C. £3,800 for street widenings.

Clitheroe T.C. £1,700 for the purpose of a new school.

Hayes U.D.C. £17,000 for a housing scheme.

Holland C.C. £7,000 for hospital extension.

Newquay U.D.C.—£1,900 for sewerage works.

Southend T.C.—£5,158 for private street works.

Tralee U.D.C.—£20,000 for the provision of working-class houses.

Winchcombe R.D.C. £12,867 for a water supply to six districts.

Youghal No. 2 R.D.C. £3,000 for the erection of houses.

LOANS SANCTIONED.

Brighton T.C. £1,000 for laying out a playing field.

Bury T.C. £1,500 for road widening and improvement.

Chester-le-Street R.D.C.—£1,820 for private street works.

Cockermouth R.D.C. £2,100 for works of sewerage and sewage disposal.

Ealing T.C. £3,318 for workmen's houses.

Harwich T.C. £2,110 for street improvement works.

High Wycombe T.C. £1,000 for the provision of a technical institute.

Hoylake and West Kirby U.D.C.—£600 for levelling the West Kirby park.

Knaresborough R.D.C.—£730 for private street works.

Mirfield U.D.C.—£557 for the purposes of the depots.

Newmarket R.D.C.—£500 for experimental works of water supply at Soham.

Paignton U.D.C.—£968 for sewer extensions.

St. Helens T.C.—£7,430 for granite setts and paving works.

FORTHCOMING INQUIRIES.

FEBRUARY.	£
1.—**Hartismere.** For the purposes of housing schemes (Mr. H. A. Chapman)	2,250
1. **Islington.** For the provision of a public convenience (Mr. E. H. Tulloch)	450
2. **Burnley.** For sewage disposal works (Mr. F. O. Stanfield)	1,200
2. **Chapel-en-le-Frith.** For works of sewerage (Mr. R. G. Hetherington)	2,000
2. **Gosforth.** For the provision of a recreation ground (Mr. Edgar Dudley)	1,750
2. **Newport (I.W.).** For the provision of pumping plant (Mr. A. W. Brightmore)	2,000
2. **Redditch.** For the electricity undertaking (Mr. H. R. Hooper)	28,000
2. **Saxmundham.** For the purposes of a hydrant section (Mr. R. H. Beckwith)	363
2.—**Wath-upon-Dearne.** For the purposes of street improvement (Mr. M. K. Nordly)	—
2. **Westminster.** For the purposes of an asylum (Major J. Stewart)	33,500
3. **Hastings.** For the provision of pumping plant (Mr. A. W. Brightmore)	1,295
3. **Kiveton Park.** For works of sewage disposal (Mr. R. G. Hetherington)	—
3. **Walthamstow.** For the electricity undertaking (Major J. Stewart)	11,000
3. **Worcester.** For the electricity undertaking (Mr. H. R. Hooper)	10,3
3. **Worksop.** For sewer and sewage works (Mr. M. K. Nordly)	2,300
4.—**Bradford.** For the purposes of a museum and granite setts paving (Mr. R. G. Hetherington)	9,291
4. **Sheffield.** For the purposes of a [illegible] chapel, heating gas and gilt [illegible] (Mr. M. K. Nordly)	17,300
4. **Swansea.** For works of sewage disposal (Major C. E. Nowell)	331,891
4. **Wandsworth.** For [illegible] library [illegible] (Major J. St. Lyon)	1,200
5. **Barnes.** For the erection of workmen's dwellings (Mr. H. V. Chapman)	7,700
5. **Bridlington.** For the purposes of [illegible] Street (Mr. Edgar Dudley)	300
Leeds. For the erection of a sewage pumping station (Mr. R. G. Hetherington)	1,630
5. **Penistone.** For the purposes of water supply (Mr. L. G. S. Outhwaite)	1,000
5.—**Tonbridge.** For the construction of a promenade (Mr. A. W. Brightmore)	1,000

Electrical Engineers and the War.—Over 700 members of the Institution of Electrical Engineers are serving in the Army and the Navy, chiefly in the Royal Engineers and the Electrical Staff of the Royal Naval Division, but considerable numbers have also joined other branches of the military forces.

Crushed Flints on Kingston Roads. The Automobile Association has written to the Kingston-on-Thames Town Council respecting crushed flints being placed on the highways in frosty weather, and the surveyor has been instructed to make enquiries as to the suitability of other material for the purposes.

Constantinople's Firemen. Lecturing at the London Camera Club on his recent experiences in Constantinople, Dr. T. Cato Worsley said that [illegible] being in witness of the Turkish capital was a house on fire. The first fire engine to arrive was something like a safe, and carried on poles by men, who proceeded first to drive a bargain with the owner of the property. A second brigade then arrived, and began to pull down the adjoining houses, reframing from quenching the fire until the price was agreed upon. Then came a third brigade, which devoted itself to preventing the other two brigades from looting what the flames had not destroyed.

PUBLIC LIGHTING IN FROME URBAN DISTRICT.

The greater part of the street lighting in the urban district of Frome is done by electricity. According to the last annual report of the surveyor, Mr. F. W. Jones, Assoc.M.Inst.C.E., there are ten arc lamps each of 1,000-candle power, and 262 metallic filament lamps, each of 50-candle power. The standards of the arc lamps are each fitted with two 50-candle power lamps which are switched on when the arcs are switched off, and, in addition, forty-five 80-candle power lamps are allowed to burn all night at points where the lights are most needed.

The sums per lamp paid for lighting are as follows: Arcs, £17; ordinary lamps, £2 15s.; all-night lamps, £2 16s. 2d. [illegible] all-night lamps at 9s. 1d.

The cost paid to the electricity department for light for the year ended March 31st last was £922 8s. 7d.

The electricity department is in the hands of Messrs. Edmundson, of Westminster, who installed the undertaking for the council, and who have undertaken to pay all loan charges incurred by the council. The payment of water will expire on September 11, 1920.

The actual sum expended upon the scheme up to the time when it was handed over to Messrs. Edmundson's firm was £43,508. The balance outstanding at the last accounts is £33,010 1s. 7d., which is being paid off at the rate of £2,767 4s. 6d. per annum.

By the agreement entered into by the council and Messrs. Edmundsons the council agree to take current [illegible] lighting until 1925.

FIRE TESTS OF "CALNO" BOARDS.

The Fibrous Plaster Building Boards, Limited, 26 Hart-street, London, W.C., recently submitted for test by the British Fire Prevention Committee a [illegible] "Calno" boards 2 ft. 6 in. in the knee, [illegible] which the latter have been classified under the "Universal Standards" as affording "Temporary Protection (Class A)." This classification is [illegible] entitling partitioning erected after the committee's official test of forty-five minutes' duration to [illegible] resisting a hose stream from a fire engine for two minutes. The maximum [illegible] Fahr. The full record of the test is published in "Red Book" No. 192. The slab of partitioning material under test was placed in a brick opening measuring 3 ft. 9 in. by 2 ft. [illegible] "Calno" boards of ¼ in. in thickness, tested by the committee for the purpose of ascertaining the resistance of the material to fire only, with food a [illegible] The average [illegible] above 1,157 deg. Fahr. The material [illegible] water test under the "Universal Standards" for the purposes of obtaining classification. The full record of the test is published in "Red Book" No. 192. The slab of partitioning material under test was placed in a brick opening measuring 3 ft. 9 in. by 2 ft.

The Reinstatement of Trenches.—Charges for the reinstatement of trenches opened in Kingston-on-Thames are [illegible] to be based on the schedule of the Metropolitan Water Board, the work to be done by the engineer of the corporation.

Shanghai Municipal Employees and the War.—The Municipal Council which controls the cosmopolitan [illegible] has decided that British employees who volunteer for the war will be reinstated if they rejoin the service within six months of the termination of hostilities.

Welsh Rural Housing.—In the course of the last meeting of the Carmarthenshire County Council a letter was read from a man in one of the country districts complaining that he had been turned out of his house because of its state of repair, and asking whether the council intended building cottages for poor people. Mr. Wm. Thomas said the rumour had to be cleared out. "Dogs, goats and pigs," he said "were living with them in the house." Mr. Nathan Griffiths said he knew of farmhouses in a certain district where "the cocks roosted on the bedstead, and the pigs made habitation in the kitchen."

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works on which particulars appear below: Buildings—Llanelly, Middlesex, Newport; roads and materials—Chapel-en-le-Frith, Easington; sewerage and sewage disposal—Ammanford, Chapel-en-le-Frith, Woking; water, gas and electricity—Ashington, Bridgwater, Easingwold, Islington, Nottingham, Skipton.—Particulars of other projected works will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Barnes U.D.C.—The surveyor, Mr. G. Bruce Tomes, has prepared estimates of the cost of the proposed subway at Sheen lane, plans of which were submitted to the council two months ago. He has submitted them to the chief engineer of the London and South-Western Railway Company, together with plans and sections of the proposal. While awaiting the report of the company's engineer, the surveyor is putting forward the scheme for dealing with the White Hart-lane crossing.

Cleethorpes U.D.C.—The Pleasure Grounds Committee have adopted a scheme for the erection of a bandstand at Sidney Park, at an estimated cost of £270.

Golligher U.D.C. Negotiations are proceeding for the purchase of a site for a fire station at Bedlinog.

Grimsby B.B.C. The question of erecting new offices is under consideration.

Lees U.D.C. A scheme has been approved for the erection of stables and the purchase of horses and carts.

Llanelly T.C.—Plans are being considered for the improvement of the north entrance to the market, at a cost not exceeding £6,000.

Middlesex C.C. Plans have been approved of a new school at Pinner, estimated to cost £9,650.

Newport (Mon.) T.C.—The Parliamentary Committee have decided to call in another expert to advise and report on the question of the new bridge.

Sleaford R.D.C.—It has been agreed to purchase premises for the purpose of conversion into council offices. The estimated cost of the scheme is £1,076.

Slough U.D.C.—It has been agreed to erect a public convenience near the council offices in William-street at a cost not exceeding £1,200.

Yarmouth T.C.—In connection with the scheme for public baths in the Beach Gardens, the borough surveyor, Mr. J. W. Cockrill, has received instructions to obtain the necessary materials, at a cost of £1,500.

HOUSING AND TOWN PLANNING.

St. Dogmells R.D.C.—The architect, Mr. J. T. J. Williams, has received instructions to prepare plans for a housing scheme.

Selby U.D.C. The Local Government Board have approved plans for a housing scheme.

Wortley R.D.C.—The council have under consideration a town planning scheme for the Wadsley Bridge and Birley Carr area.

REFUSE COLLECTION AND DISPOSAL.

Kensington B.C. It has been decided to purchase a second "Lilly" [illegible] machine at a cost of £698. The Works Committee report that the one purchased in August has been doing the work of four or five horses. It has travelled an estimated distance of 5,000 miles, and the consumption of fuel has been at the rate of 11·8 miles per gallon.

ROADS AND MATERIALS.

Aberavon B.C. The council decided to [illegible] the [illegible] of a new road between Llewellyn and New Orchard, which is intended to serve as a link between the Aberavon Pottery and New Orchard. The clerk read a communication from the Board of Trade intimating that the Road Board were prepared to increase their contribution towards the expenditure from £50 to £100, and the county council desired to know if the corporation the district council was prepared to make. After considering the subject the council decided to postpone action until after the present crisis.

Chapel-en-le-Frith R.D.C.—The council have under consideration a scheme for the construction of a new road from Whaley Bridge to Bugsworth, the estimated cost of which is £7,000. In this scheme, which has been prepared by the engineers, Messrs. Brady & Partington, Chapel-en-le-Frith, and Mr. E. J. Hunter, the council's surveyor, bridges will be required over the Great Central Railway Canal and the river Goyt.

Croydon R.D.C.—An amended plan for making up Brambledown-road, at an estimated cost of £883, has been prepared by the surveyor, Mr. R. Chart.

Easington R.D.C.—A deputation has been nominated to interview the county council on the subject of the proposed new road at Trimdon. The estimated cost of the scheme is £3,600.

East Grinstead U.D.C.—The council have approved plans for making up Warren-road, at an estimated cost of £468.

Egham U.D.C.—The surveyor, Mr. W. Menzies, has received instructions to resurface the asphalt footpaths in Station-road and Avenue-road, at an estimated cost of £130.

Exeter T.C.—The Streets Committee have approved a scheme for widening Pinhoe-road, at an estimated cost of £777.

Harwich T.C.—Work is to be put in hand for the widening of London-road, at an estimated cost of £1,650.

Leek U.D.C.—The Local Government Board have sanctioned a scheme for the construction of new streets [illegible].

Rutland C.C. The council have decided to make application to the Road Board for a [illegible] Oakham.

Staffs C.C.—It has been agreed to divert and widen the Great Bridgeford and Woodseaves main road near Gamesley Brook, at an estimated cost of £780.

Wrexham T.C.—The council on Tuesday resolved to pave Bradley-road with granite setts, at an estimated cost of £1,629, towards which the Road Board has made a grant of £500.

Youghal No. 1 R.D.C.—The council have agreed to the scheme of the county surveyor to relay with asphalt the road over Youghal Bridge on the main road to Dungarvan, at an estimated cost of £650.

SEWERAGE AND SEWAGE DISPOSAL.

Ammanford U.D.C.—The council have deposited a Bill for introduction into Parliament next Session. The main purpose of this Bill is to give effect to the powers conferred upon the Amman Valley Joint Sewerage Board, which was formed last year by a Local Government Board Order, for the purpose of constructing a [illegible] for receiving and disposing of the drainage of, among other districts, the Amman Valley drainage areas. By the first eight clauses of the Bill the district council ask for powers to lay down fifty-four lines of pipes for connecting the various streets, &c., of their district with the main, to be constructed by the Joint Sewerage Board. The cost of these works, including the purchase of the necessary lands, is estimated at £18,650.

Bishop's Stortford U.D.C.—A proposition to postpone the work having been defeated, notice of motion has been given that the council proceed with the Hockerill sewerage scheme.

Chapel-en-le-Frith R.D.C.—A scheme is in preparation for submission to the Local Government Board for a joint sewerage scheme and sewage disposal works for Bamford and Thornhill, estimated to cost £7,000.

Chorleywood U.D.C.—With respect to a proposal to make up certain roads, the chairman of the Sanitary Committee, Mr. Hodges, with the surveyor, Mr. W. H. Scott, and the clerk, had an interview with an officer of the Local Government Board, who made it quite clear that the board could not see their way to sanction a loan for the purpose of making up roads unless a soil sewer was put in at the same time. Mr. Hodges stated that the committee had considered it might be

a drag-cut, and to take up a sewage chamber on the district had been reported on, and that the pipes might not be up for the season which an expert when called in, would wish. After a good deal of discussion the official suggested three alternatives—viz., making the present storm-water drain the soil sewer later on, making a separate trench for both lines of pipes, or putting in a soil sewer at the same time, but below the storm water drain. He strongly urged the last-mentioned as the best and cheapest course in the long run for the ratepayers. The council, having discussed the matter, decided that an expert should be called in immediately to advise on the system of drainage.

Crompton U.D.C.—Plans have been approved for the proposed extensions to the sewage disposal works. The estimated cost, £2,200, is made up as follows: Detritus tanks, £153; storm-water tanks, £327; precipitation tanks, £187; manholes, £86; [illegible] £896; [illegible] £111.

Lochgelly (Forfar) T.C.—Some of the difficulties incidental to sewage disposal schemes were alluded to at the council meeting recently when the proposed construction of [illegible] was under consideration. It was stated by the clerk that Lord Minto would be willing to grant a site for the works upon the following terms—viz.: (1) The area of the ground to be 4½ acres, at the rate of £10 per acre per annum; (2) the town council to settle all claims by the tenant of the ground, including claims connected with the access to the ground; (3) the town council to fence the ground; (4) wayleave for sewage pipes to be granted at the rate of 1s. 6d. per yard; (5) the town council to be liable for all claims for damage caused by the laying or repairing of the pipes, no cess drain to be made on the surface of the ground; (6) if any such are required, to be paid for over and above the wayleave of 1s. 6d.; (7) all minerals to be reserved, with full power to work them, even to the extent of lowering the surface without being liable for any damage which may be caused, the council to pay the whole expenses of the transaction. The councillors expressed surprise at the terms, which they characterised as very harsh. Bailie Hunter (who presided) said it would ruin Lochgelly to accept such terms. Councillor Barclay said the agreement should be published in order to let the people know how they were treated when requiring a piece of land.

Louth T.C.—The council have adopted a report by the Drainage Committee recommending that Mr. Baldwin Latham should be instructed to prepare plans for the additional works required to be carried out for taking all the sewage out of the river Lud, with a view to an application to the Local Government Board for a further loan.

Newquay U.D.C.—The council have approved the plans of the surveyor, Mr. T. Harford, for a sewer in Beach-road, with manholes, at an estimated cost of £250.

Oulton Broad U.D.C.—The council have referred to the Drainage Committee a letter from the Local Government Board urging the adoption of a sewage disposal scheme. It is pointed out in the letter that the cost of emptying cesspools and scavenging is now about £1,000 a year, a sum which would probably cover the cost of maintenance and go towards meeting the expenses of a proper system of sewerage and sewage disposal. Having regard to the financial position of the district, the board stated that they were willing to consider an application for sanction to a loan for a scheme dealing only with the more populous areas, and they think that the council would be well advised to proceed with the preparation of such a scheme.

Petersfield R.D.C.—It has been decided to ask for sanction to a further loan for the purpose of the Liss sewerage scheme.

St. Columb R.D.C.—It is proposed to construct septic tanks in connection with the sewerage scheme for Crantock.

Stoke-on-Trent T.C.—The Sewerage Committee have agreed to adopt the Strongford site for the proposed sewage disposal works.

Sutton (Surrey) U.D.C.—The Farm Committee have requested the surveyor, Mr. W. H. Grieves, to go into the question of treating the sewage on land at the low-level works, and again submit the reports and plans he has already prepared. The question of the [illegible]

Whitby R.D.C.—[illegible] drainage scheme on several roads.

Woking U.D.C.—The engineer has prepared the specification [illegible]

WATER, GAS, AND ELECTRICITY.

Ashington (Northumberland) U.D.C.—The council are promoting a Bill in Parliament seeking powers to secure water from Tosson, Rothbury. The estimated cost of the [illegible] £73,000 for mains outside the Ashington district, and £8,000 for mains, service pipes, &c., inside the district, making £81,000 altogether. When the money is borrowed it is proposed that the £73,000 should be repayable in sixty years, and the £8,000 in thirty years. The present [illegible]

Ayrshire C.C.—The Northern District Committee have reported favourably upon a scheme prepared by the newly formed special water supply district of Barrwill for a loan of £1,500 to cover the cost of a water supply, plans for which have been prepared by Messrs. Watson & Sons, engineers.

Barnes U.D.C.—It has been resolved to present a petition against the London and Home Counties Supply Bill to be promoted by the London County Council.

Bethnal Green B.C.—The council have accepted the tenders of the Lancashire Electric Power Company, Limited, of Manchester, for the supply and erection of [illegible] transformers and [illegible] switch gear. They also decided to issue advertisements inviting tenders for the erection of a western [illegible] at New Inn-yard and an easterly sub-station at the Digby-street depot. An estimate of £15,944 for the supply and laying of cables and execution of road work in connection with the new electricity undertaking has also been adopted. It is to be stipulated that the contract for cables and accessories shall be manufactured by British firms.

Blaenavon U.D.C.—It has been decided to provide [illegible] and a service reservoir at [illegible] at an estimated cost of £6,000.

Bridgwater R.D.C.—[illegible] of a water supply for Chilton-upon-Polden [illegible] forwarded to the parish meeting. The estimated cost of the scheme is £2,272.

Easingwold R.D.C.—The council recently considered the question of an additional water supply, the matter coming up on a letter from the Local Government Board which referred to a proposition to borrow £8,657 for what is known as the Wass scheme, which was designed to give a better supply to Creyke, Easingwold, Sessay, Oulston, Stillington and Thornton-on-the-Hill. The board also asked for the result of the gauges which were to be taken, and it was resolved that this information be given.

Greenock T.C.—Recently the Secretary for Scotland sanctioned the borrowing of £30,000 to make provision for the increasing needs of the electricity undertaking, and at a special meeting on Monday it was decided to ask power from the Scottish Office to borrow an additional £20,000 for the purchase of a new turbo-generator of 5,000-kw. capacity.

Hawick T.C.—The water inspector has reported that between the months of August and December, by the repairing of [illegible] a saving of water was effected to the extent of 390,000 gallons per day.

Islington B.C.—A scheme to extend the municipal electricity undertaking, at an estimated cost of £52,000, has been prepared.

Leake R.D.C.—The council on Tuesday resolved to forward to the parish council a letter from the Local Government Board recommending the provision of a pipe water supply to Sutton Bonnington from the mains of the Derwent Valley Board.

Ludlow R.D.C.—The council have received from Messrs. Willcox & Raikes a report on the Craven Arms water supply scheme, stating that the yield equalled 30,000 gallons a day. The report has been forwarded to the Local Government Board.

Luton T.C.—The electrical engineer has prepared a scheme for the provision of a "stand-by" plant at the electricity works, and this is now under the consideration of the council.

Newcastle West (Ireland) U.D.C.—The ratepayers have expressed a feeling in favour of [illegible]

present system of public lighting by oil lamps, and adopting a scheme of electric lighting.

Nottingham T.C.—The Electricity Committee have been granted authority to raise additional capital for underground mains and services. They have expended the whole of the capital sum of £44,500 sanctioned by the council in November, 1903, and now require £20,000.

Perth T.C.—The question is under consideration of purchasing the undertaking of the Methvin Gas Light Company.

Skipton U.D.C. It has been resolved to apply to the Board of Trade for authority to establish electricity plant at an estimated cost of £13,000.

Southampton T.C.—The question of an additional supply which the waterworks engineer believes is obtainable at Otterbourne was the subject of a report from Dr. A. C. Houston, as the result of the consideration of which the committee offered its cordial thanks and congratulations to the waterworks engineer on his finding of an additional source of supply of water for the borough.

Tanderagee U.D.C.—Messrs. Swiney & Croasdaile, MM.INST.C.E., Belfast, are preparing particulars and estimated cost of a water supply for the urban district from the Portadown and Banbridge Water Board, and from the Glenoran springs.

Wigton R.D.C.—The council recently accepted the offer of the Carlisle City Council to supply water in bulk to the rural council for the supply of Bowness-on-Solway at 8d. per 1,000 gallons, the price to be reduced later to 6d. per 1,000 gallons. The Carlisle Rural Council are opposing the scheme, disputing the city council's right to supply water outside its own area.

MISCELLANEOUS.

Barnes U.D.C. The council have purchased a 60-ft. fire escape, which the surveyor, Mr. C. Bruce Tomes, reports is quite satisfactory.

Cheltenham R.D.C.—In view of the surveyor, Mr. C. Benyon, being called up for military service as a National Reservist, it has been decided to pay him such a sum as with his military pay and separation allowance will make the sum receivable by him equal to his salary at the time of his being called up; also that his post of road surveyor be kept open for him until his return from service.

Hove T.C.—The electrical engineer, in a report on the electricity undertaking, recommends the installation of new machinery at an estimated cost of £6,970. —The present contract for the supply of horses, carts and drivers expires on March 31st, and the Works Committee recommend the acceptance of an offer to continue the contract for a period of one year at the price of 8s. 8d. per day per horse and man.

Northants C.C.—The period of four years in which the county surveyor was to receive £250 per annum to cover all his travelling expenses having expired, the council have resolved that the arrangement be discontinued, and, on condition that the county surveyor continues to provide his own motor-car, that he be paid an allowance of 6d. per mile travelled by motor-car, and his actual railway fares and cost of refreshments.

Woking U.D.C. The question of providing a motor fire engine is to be considered as soon as the time is suitable for raising a loan upon reasonable terms.

Housing and Town Planning Conference. A conference of local authorities in the Western Midlands was held at the Council House, Birmingham, on Tuesday and Wednesday, under the auspices of the Housing and Town Planning Council, to consider housing and town planning administration, with special reference to the administration of the new Housing Act during the period of the war. Councillor Harold Shawcross, chairman of the council, presided. Resolutions were passed urging local authorities to place in hand without delay the necessary preliminary work in regard to housing schemes, and asking that the terms in regard to housing loans under the Act (announced by the Chancellor of the Exchequer in the House of Commons on Tuesday, November 24th) should be maintained without change during the period for which the Act will be in operation, and for the full £4,000,000 provided under the Act.

PERSONAL.

Mr. Richard Saunders, assistant borough surveyor, Gravesend, has been appointed borough surveyor of Sandwich.

Mr. R. S. Scott, surveyor to the Bishop's Stortford Urban District Council, who is indisposed, has been urged by the council to take a holiday.

Mr. H. Norman Jepson, of the borough surveyor's office, Kingston-on-Thames, has been successful in the examination for admission as an associate of the Royal Institute of British Architects.

Prof. E. R. Matthews, of the University of London, has been called in to advise one of the American cities on the subject of coast protection, and will sail for New York when the Easter vacation begins. He has also been called in recently to advise at three of our coast towns.

Mr. Arthur Thomas Walmisley, the author of the illustrated article on groynes and sea walls which appears in the present issue, is well known as the engineer to the Dover Harbour Board, a position which he has held since 1883, besides carrying on private practice at Westminster. Born in London nearly sixty-eight years ago, Mr. Walmisley was educated at King's College School, and subsequently at King's College, London, and commenced his engineering career as articled pupil to the late Mr. R. M. Ordish, of Great George-street. Afterwards

Mr. A. T. Walmisley, M.Inst.C.E.

he became resident engineer upon the Albert Bridge, Chelsea, and later entered the office of the well-known Westminster firm of Edwin Clark, Punchard & Co. Here he served directly under the late Mr. Edwin Clark, who acted as resident engineer under Robert Stephenson on the Britannia and Conway tubular bridges. Subsequently he assisted Mr. Clark's brother, Mr. Latimer Clark, with designs for floating docks. In 1876 Mr. Walmisley was engaged under Mr. (now Sir) Alexander Binnie upon the Bradford reservoir and high-level water supply. A year later he returned to London, and commenced practice as a civil engineer in Victoria-street, and has since carried out many notable works. Mr. Walmisley has frequently given evidence before Parliamentary Committees, and has acted as arbitrator in numerous legal cases. He is a prominent member of the Institution of Civil Engineers, a past-president of the Civil and Mechanical Engineers' Society and of the Society of Engineers, a Fellow of the Surveyors' Institution, an hon. associate of the Royal Institute of British Architects, and a lecturer on waterways, harbours and docks at University College, London. Finally, it may be mentioned that he is the author of "Iron Roofs"—which has passed through a second edition—"Field Works and Instruments," "Land Surveying and Levelling," and numerous articles and monographs on professional subjects. Mr. Walmisley is senior partner in the firm of A. T. Walmisley & White.

SCIENTIFIC OBSERVATION IN ROAD CONSTRUCTION.*

By F W [illegible] Assoc.M.Inst.C.E.
Engineer and Surveyor to the Frome Urban District Council.

It would seem that the subject occupying the chief attention of municipal engineers and surveyors is at least the one on which we all meet on common ground, is that of highway construction. The difficulties peculiar to our sewage schemes, water supplies and housing and town planning are more personal affairs, requiring a more local treatment than this great question of our highways. This is a personal question so far as the principal roads of the country are concerned.

If these roads are to be made fit for the traffic which they are called upon to perform road engineers must couple science with practice in order to achieve the desired end. To pursue the old policy of dumping many tons of stone of low cost per ton [illegible] can be obtained locally, only to result in the production of mud and dust in a ratio increasing [illegible] as the increase in traffic, is utter folly and a serious waste to the community, besides causing grave discomfort to all road users.

It is manifestly evident to the most casual observer that the roads which were built for the comparatively light traffic of the past cannot be considered equal to the task of supporting the heavy [illegible] of present-day motor lorries and other heavy motor traffic. The bridge engineer cares for the bridge for the load it has to carry, and the road engineer must be afforded the means of designing the road for the load it has to carry, and I would add that the road engineer of to-day can do this if a means can be afforded him of using the right material.

Local authorities are not always easily persuaded of the necessity for a change in their road-making policy, and, even in the face of the best advice of their servant the engineer, they cling to old ideals. Under such circumstances the most convincing argument that the engineer can possibly bring to his aid is that of cost. Careful kept records of the cost of maintenance, class of foundations, and traffic and weather conditions are absolutely essential to the road engineer, and are the best evidence upon which to base advice to those employing him.

Coming to another phase of the question, however wicked some local authorities may be to effect an improvement on their roads sufficient to meet the enormous increase in the traffic which has come upon them, they cannot satisfy their wish owing to lack of sufficient funds. To meet the state of affairs it is hoped that ere long the unfair burden cast upon the ratepayer by long-distance through traffic on his roads will be lightened by the cost of maintenance of the more important roads being made a national charge, as a result of the classification of highways. Such a step as this followed by properly organised investigation on scientific and practical lines, ought to prepare our greatest highways for that even more exacting demand which will yet be made upon them.

RECENT PROGRESS.

The greatest credit should be given to those road engineers and others who have by individual personal investigation assisted in the advancement of our knowledge of road construction during the past few years. There are those who have given us the benefit of practical work done in this cause, others have gone outside the orthodox methods, and have endeavoured to analyse the subject upon purely scientific lines. It will be interesting to know how far scientific observation can assist in solving the road question.

Apart from the examination of the materials constituting a water-bound macadam road there is very little opportunity for science in the actual structure of such a road; that is to say, it would be difficult to bring applied mechanics to bear upon the question of foundation or crust strength in a material which is as quickly affected by weather conditions as a water-bound macadam. I fear the search for varying values of K, which, let us imagine, is the factor to be incorporated in the formula for weather conditions would only end in a visit to Wells, not necessarily for the purpose of seeing if the county surveyor had succeeded in the quest, but to enter a well-known public institution there for necessary rest. There is, however, room for science in the choice of the road constructed with a rigid concrete foundation, and a [illegible] attended the efforts of the road designer, that he should [illegible] a knowledge of the strength of materials which it is proposed [illegible] be discussing the efficiency of our roads in terms of moments of resistance of the material composing them, as opposed to the bending moments, shear and deflection produced by the loads they have to carry.

To [illegible] age of roads throughout the United Kingdom, built, as these roads will have to be, upon a variety of subsoils, the fundamental necessity must be a solid foundation, and in the provision of this science will help the engineer to decide upon the minimum section of foundation to adopt for any particular traffic load. Then, as regards the wearing crust to be placed upon the foundation, scientific investigators have already been at work upon various materials many of which [illegible] upon water-bound macadam. Doubtless in future, under the guidance of the Road Board, this work will be [illegible] as to allow of easy comparison. Such a course would, it is imagined, lead to the desired goal in a quicker and less expensive way than can be effected by the individual worker.

* Extracts from presidential address delivered at the annual meeting of the Association of Somerset Surveyors on Saturday last.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President Mr J S Pickering, M.Inst.C.E. Borough Surveyor and Water Engineer, Cheltenham.

DONCASTER MEETING.

A North-Eastern District meeting is to be held at [illegible] (Saturday).

Programme.

2.30 p.m.—Meeting in Mansion House. Short paper [illegible] Notes on Extract from Traffic," by Mr. F. Oscar Kirby, M.Sc., Assoc.M.Inst.C.E., borough engineer, Doncaster.

1.30 p.m.—Tea, by kind invitation of his Worship the Mayor (Mr. S. Balmforth).

3.0 p.m. [illegible]

[illegible]

[illegible]

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ROYAL SANITARY INSTITUTE.

MANCHESTER MEETING.

At a meeting of the Royal Sanitary Institute to be held at Manchester on Friday, February 19th, a discussion on "The Construction of Sewers," which will be illustrated by lantern slides, will be opened by Mr. S. S. Platt, M.Inst.C.E., borough engineer of Rochdale, and on "Housing from the Sanitary Inspector's Standpoint," by Mr. H. Dryland, of the Manchester Sanitary Department.

The chair will be taken at 7 p.m. by Sir Henry Tanner, C.B., I.S.O., F.R.I.B.A.

On the following day the chairman of the Rivers Committee of the corporation, Alderman Frowde, has kindly consented to arrange for the members to inspect an interesting section of the Manchester main drainage scheme.

SOCIETY OF ENGINEERS.

At a meeting of the Society of Engineers to be held on Monday next, at the Institution of Electrical Engineers, Victoria Embankment, W.C. (south end of Savoy-street, near Waterloo Bridge), Mr. H. C. H. Shenton (president, 1914) will present the premiums awarded for papers published in the *Journal* during 1914.

Mr. Norman Scorgie, the president for 1915, will then deliver his presidential address.

The chair will be taken at 7.30 p.m. precisely.

A. S. E. Ackermann,
Secretary.

17 Victoria-street, S.W.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

HIGHWAY SURVEYOR.—February 1st.—Newton Abbot Rural District Council. £150 per annum.—Mr. F. Horner, clerk, Council Offices, Newton Abbot.

CLERK OF WORKS.—February 1st.—Bromley Rural District Council. £2 2s. per week. Mr. R. Craig, highway surveyor, Farnborough.

ASSISTANT.—February 1st.—Goole Urban District Council. £75 per annum.—Mr. J. H. Castle, engineer and surveyor, Council House.

INSPECTOR OF NUISANCES.—February 2nd.—Totnes Rural District Council. £60 per annum.—Mr. J. S. Portch, deputy clerk, 19 High-street, Totnes.

CLERK OF WORKS.—February 2nd.—Barrow-in-Furness Town Council. £3 per week.—Borough Engineer and Surveyor.

ROAD FOREMAN.—February 3rd.—Corporation of Leamington. 34s. per week.—Mr. L. Rawlinson, town clerk.

TEMPORARY CLERK.—February 3rd.—Borough of Chipping Wycombe. 30s. per week.—Mr. E. J. Rushbrooke, borough engineer and surveyor, 25 Easton-street, High Wycombe.

ENGINEERING ASSISTANT.—February 4th.—Corporation of Dewsbury. £100 per annum.—Borough Engineer, Town Hall.

MAIN ROADS INSPECTOR.—February 4th.—Glamorgan County Council. £100—£120 a year.—Mr. G. A. Phillips, county surveyor, County Hall, Cardiff.

ROAD FOREMAN.—February 5th.—Corporation of Exeter. £150 per annum.—Mr. H. Lloyd Parry, town clerk.

CLERK OF WORKS.—February 5th.—Corporation of Exeter. £150 per annum.—Mr. H. Lloyd Parry, town clerk.

CLEANSING SUPERINTENDENT.—February 5th.—Corporation of Exeter. £120 per annum.—Mr. H. Lloyd Parry, town clerk.

FOREMAN.—February 6th.—Corporation of Batley. 30s. per week.—Mr. J. H. Craik, town clerk.

ENGINEERING ASSISTANT.—February 6th.—Corporation of Birkenhead. £120—£150 per annum.—Mr. C. Brownridge, borough engineer and surveyor, Town Hall.

CLERK OF WORKS.—February 6th.—Swinton and Pendlebury Urban District Council. £3 per week.—Mr. Henry Entwisle, surveyor.

ASSISTANT ENGINEERS.—February 6th.—Port of London Authority. Chief Engineer, 109 London-street, London, E.C.

CLERK OF WORKS.—February 8th.—Tilbury Urban District Council. £3 15s. weekly.—Mr. S. A. Hill Willis, engineer and surveyor.

ROAD FOREMAN.—February 8th.—Bradford-on-Avon Urban District Council. 27s. per week.—Mr. R. B. Lees, surveyor, Westbury House, Bradford-on-Avon.

COUNTY SURVEYOR.—February 27th.—County Council of Notts. £750 per annum and travelling expenses.—Mr. H. Hampton Copnall, clerk, Shire Hall, Nottingham.

ASSISTANT ENGINEERS. — April 1st. — Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

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CONNAH'S QUAY.—February 3rd—27th.—Designs for laying out 3 acres of grounds and the erection of working-class houses, for the urban district council.—Mr. T. W. Hughes, clerk, Council Offices, Connah's Quay, near Chester.

LIVERPOOL.—February 8th.—Designs for workmen's dwellings for about 500 persons. Premiums, £100, £50, and £25.—The Town Clerk.

CLUTTON.—February 23rd.—Schemes for providing a public water supply, for the parishes of Chelwood, Chew Magna, Chew Stoke, Norton, Malreward, Publow, and Stanton Drew, for the rural district council. Premiums of £100 and £50 will be awarded to the first and second best competitors.—Mr. J. Sumner Dury, clerk, Temple Cloud, Bristol.

WALTHAMSTOW.—Plans for the erection of workmen's dwellings at an estimated cost of £16,000, for the urban district council.—Mr. C. S. Watson, clerk, Town Hall.

BRADFORD.—Designs for the re-planning of streets in the central area of the city, for the corporation. Mr. Reginald Blomfield, R.A., has been nominated assessor.—Mr. F. Stevens, town clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

GREAT TORRINGTON.—February 1st.—For the removal of cottages, and the erection of five dwelling-houses, for the corporation.—Mr. W. C. Medland, borough surveyor.

KINGSTOWN.—February 1st.—For the erection of thirty-six dwellings, for the urban district council.—Mr. T. F. Slevin, St. Stephen's Green, Dublin.

MALDON.—February 1st.—For the erection of a keeper's lodge and lavatories, for the corporation.—Mr. T. R. Swales, borough engineer and surveyor.

LONDON.—February 2nd.—For the supply of building materials, for the Prison Commissioners.—Home Office, Whitehall, S.W.

LONDON.—February 2nd.—For the reconstruction of Eltham Green bridge, for the London County Council.—The Clerk, County Hall, Spring Gardens, S.W.

SHEFFIELD.—February 2nd.—For the erection of a transformer sub-station, for the Electric Supply Committee.—Electric Supply Offices, Corporation street, Sheffield.

PORTSMOUTH.—February 4th.—For extensions to a hospital, for the corporation.—Mr. G. H. Etherton, town clerk.

CONGLETON.—February 4th.—For the erection of a school, for the Congleton Union area.—Messrs. A. Price & Sons, architects, Sandbach.

ESSEX.—February 4th.—For the erection of a mortuary, for the county council.—Mr. C. Ingleton Foxcroft, 79 Duke-street, Chelmsford.

HULL.—February 6th.—For the construction of a ferro-concrete service tank and water tower, for the corporation.—Mr. C. E. Newton, gas and water engineer.

NEWTON-IN-MAKERFIELD.—February 6th.—For the erection of thirty cottages, for the urban district council.—The Surveyor, Town Hall, Earlestown, Lancs.

BROADSTAIRS.—February 8th.—For the construction of buildings, fencing, and weighbridge, for the rural district council.—Mr. H. Hurd, Council Offices.

PORTSMOUTH.—February 8th.—For additions to a school, for the Education Committee.—Mr. A. H. Bone, surveyor, Cambridge Junction, Portsmouth.

PENZANCE.—February 8th.—For the erection of workmen's dwellings, for the corporation.—Messrs. Cowell & Drewett, architects, Leonard's Chambers, Penzance.

ILFORD.—February 9th.—For the erection of lavatory accommodation at the town hall, for the urban district council.—Mr. H. Shaw, engineer and surveyor, Town Hall.

WORCESTER.—February 9th.—For the construction of new filter tanks, brook conduit, sand store, mains and other works at the waterworks, for the corporation.—M. T. Clark, city engineer, Guildhall.—Waterworks.

TEWKESBURY.—February 10th.—For the erection of six cottages, for the rural district council.—Messrs. Prothero, Phillott & Barnard, 31 Promenade, Cheltenham.

HAMPSHIRE.—February 10th.—For the erection of a pair of cottages, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

COVENTRY.—February 10th.—For the extension of a school, for the Education Committee.—Messrs. G. & I. Steane, 22 Little Park-street, Coventry.

LITTLEHAMPTON.—February 10th.—For the erection of an isolation hospital, and also public lavatories, for the urban district council.—Mr. H. Howard, surveyor.

LAMBETH.—February 11th.—For the repair and renewal of the iron and boot arches, and also the repair of the lanterns to the stable portion of the upper buildings, for the borough council.—Mr. H. Edwards, borough engineer, Town Hall, Brixton-hill, S.W.

RADCLIFFE.—February 13th.—For the erection of sixteen houses, for the urban district council.—Mr. W. L. Rothwell, engineer and surveyor.

HIRWAIN.—February 15th.—For the erection of a school, for the Joint Schools Committee.—Mr. T. Botting, Education Offices, Aberdare.

LOCHGOILHEAD.—February 16th.—For the erection of three double cottages, for the town council.—Mr. J. Whitton, superintendent of parks, 249 George-street, Glasgow.

TORONTO.—February 16th.—For the construction of a refuse incinerating plant, for the Board of Control.—Street Commissioners, Department of Street Cleansing, Toronto.

RHONDDA.—February 19th.—For the erection of a secondary school, for the urban district council.—Mr. J. Rees, architect, Hillside Cottage, Pentre.

WEST RIDING.—February 19th.—For additional classrooms at the Hemsworth Kinsley school, for the Education Committee.—Education Architect, County Hall, Wakefield.

ST. HELENS.—February 23rd.—For the erection of a refuse destructor, for the corporation.—Mr. A. W. Bradley, borough engineer.

STOCKPORT.—March 1st.—For the erection of a refuse destructor, for the corporation.—Mr. J. Atkinson, borough surveyor.

BOMBAY.—March 7th (date extended).—For the erection and equipment of a refuse destructor, for the Municipal Commissioner.—Messrs. Henry S. King & Co., 65 Cornhill, London, E.C.

Roads.

HERTS.—February 1st.—For the supply of hand-picked surface flints, dug gravel, hoggin, shingle, sand and team labour, for the county council.—Mr. J. S. Killick, county surveyor, Hatfield.

SOMERSET.—February 1st.—For the supply of broken granite or basalt, and steam rolling, for the county council.—Mr. E. Stead, county surveyor, Wells.

SUTTON-IN-ASHFIELD.—February 1st.—For the supply of tar-macadam and broken slag, for the urban district council.—Mr. W. Burn, surveyor.

NORTHANTS.—February 1st.—For the haulage of road metal, for the county council.—Mr. C. S. Morris, county surveyor, County Hall, Northampton.

NORTHANTS.—February 1st.—For the supply of broken granite, tar-macadam, and slag, for the county council.—Mr. C. S. Morris, county surveyor, County Hall, Northampton.

DEVON.—February 2nd.—For steam rolling and scarifying, for the county council.—Mr. R. M. Stone, county surveyor (No. 1 Division), The Square, Barnstaple.

PORTSLADE.—February 2nd.—For the supply of granite chippings, for the urban district council.—Mr. A. Taylor Allen, surveyor.

ESCRICK.—February 2nd.—For the supply of best whinstone, tar-macadam, slag, granite, grouting tar, and spraying tar, for the rural district council.—Mr. J. R. Hudson, surveyor, 4 Heslington-road, York.

EAST GRINSTEAD.—February 2nd.—For the supply of sand or grit, for the rural district council.—Mr. F. S. White, clerk, 6 High-street, East Grinstead.

CHINGFORD.—February 2nd.—For the supply of road materials, for the urban district council.—Mr. L. C. Bowen, clerk, 34 Station-road, Chingford.

MIDDLESBROUGH.—February 2nd.—For the supply of whinstone for macadamising, for the rural district council.—Mr. W. H. Dixon, district surveyor, Kirkby-in-Cleveland, near Stokesley, Yorks.

CARSHALTON.—February 3rd.—For making up certain roads, for the urban district council.—Mr. W. W. Gale, surveyor.

MIDDLESEX.—February 3rd.—For the supply of about 7,500 tons of 2-in. and 1½-in. hand-broken basalt, and 500 tons of ¾-in. chippings, for the county council.—Mr. H. T. Wakelam, county engineer, Middlesex Guildhall, Westminster.

CUCKFIELD.—February 3rd.—For the supply of about 7,000 tons of broken granite, tarred material, and flints, for the rural district council.—Mr. A. MacArthur, surveyor, Council Offices, Haywards Heath.

LANARK.—February 3rd.—For the supply of road metal, for the Upper District.—Mr. J. A. McCallum, district clerk, 15 West George-street, Glasgow.

STOKESLEY.—February 4th.—For the supply of whinstone, limestone, and tarred slag and whinstone for macadamising, for the rural district council.—Mr. W. H. Dixon, district surveyor, Kirkby-in-Cleveland, near Stokesley, Yorks.

HORNCASTLE.—February 6th.—For the supply of granite and slag, for the rural district council.—Mr. J. E. Chatterton, clerk.

WELLINGBOROUGH.—February 6th.—For the supply of granite for the rural district council.—Mr. W. Jackson, clerk.

GLAMORGAN.—February 6th.—For the supply of road material and haulage for the county council.—Mr. G. A. Phillips, county surveyor, County Hall Cardiff.

PLOMESGATE.—February 8th.—For the supply of broken granite and flint, for the rural district council.—Mr. D. R. Read, clerk, Board Room, Wickham Market, Suffolk.

BEVERLEY.—February 8th.—For the supply of stone for macadamising, for the rural district council.—Mr. E. Picker, surveyor.

BIRKENHEAD.—February 8th.—For the supply of granite, Rawtenstall kerbs and channels, Penmaenmawr breaking stone, natural flags, paving setts, and creosoted red deal paving blocks, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor.

HERTS.—February 8th. For the surface-tarring of main roads, for the county council. Mr. J. S. Killick, county surveyor, County Surveyor's Office, Hatfield.

WALTHAM.—February 8th. For the supply of granite, flints, gravel, hoggin, ballast, sand, tar-macadam, and tar-spraying, for the urban district council. Mr. W. C. Holloway, engineer and surveyor, Town Hall, Waltham Abbey.

EXETER.—February 8th.—For road widening and street works, for the corporation.—Mr. T. Moulding, city engineer and surveyor.

CHADDERTON.—February 8th. For the supply of rubble stone and slag tar-macadam, for the urban district council. The Surveyor.

LONDON.—February 9th. For paving works, for the London County Council. Chief Engineer, County Hall, Spring gardens, S.W.

EASINGWOLD.—February 10th. For the supply of whinstone and slag, for the rural district council.—Mr. E. J. H. Robinson, clerk.

BRADFORD.—February 10th. For the cartage of road metal and team labour, for the corporation. Mr. W. H. S. Dawson, city engineer and surveyor.

CANTERBURY.—February 11th.—For the supply of road materials, for the corporation.—Mr. A. C. Turley, city surveyor.

WETHERBY.—February 11th.—For the supply of broken whinstone, granite, limestone, slag, and tar-macadam, for the rural district council. Mr. A. G. Kilner, highways surveyor.

GRAYS THURROCK.—February 11th. For the supply of 900 tons of basalt or granite chippings, for the urban district council.—The Surveyor, High-street, Grays.

KEYNSHAM.—February 12th.—For the supply of granite or basalt, limestone, and tarred macadam, also for the supply on hire of two or more steam rollers and scarifiers, for the rural district council.—Mr. J. Johnson, surveyor.

HAILSHAM.—February 13th.—For the supply of road materials and cartage, for the rural district council. — Mr. E. Catt, clerk, 17 London-road, Hailsham.

LEYLAND.—February 15th.—For the supply of broken granite, slag, tar-macadam, limestone dust, kerbs, setts, rubble, and concrete and natural flags, for the urban district council. Mr. M. H. Wilkinson, surveyor, Leyland Lanes.

ROTHERHAM.—February 17th. For the supply of granite and slag, for the rural district council.—Mr. R. Bradbury, district surveyor, Imperial Buildings, Rotherham.

SHREWSBURY.—February 17th. For the supply of broken macadam, tarred granite macadam, tarred slag, broken slag, tar-spraying, distilled tar, crossing blocks, Yorkshire or Lancashire kerbs, flags, and channels, and concrete flags, for the corporation. Mr. A. Ward, borough surveyor, The Square, Shrewsbury.

NEWMARKET.—February 18th.—For the supply of best broken Leicestershire granite and tarviated granite chippings, for the urban district council.—Mr. W. H. Eley, surveyor.

CHESHIRE.—February 20th.—For the supply of refined tar, Tarvia, or Tarco, for the county council.—Mr. W. Holland, county surveyor, The Castle, Chester.

TANGIER.—February 20th.—For works of road construction and improvement, for the Special Committee on Public Works. Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

CHESHIRE.—February 20th. For the supply of macadam, tar-macadam, and chippings, for the county council.—Mr. W. Holland, county surveyor, The Castle, Chester.

MARPLE.—February 22nd.—For the supply of granite macadam and chippings, Macclesfield macadam and chippings, limestone macadam and chippings, flints, setts, and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor, Council Offices, Marple.

LITTLE HULTON.—February 22nd. For the supply of broken granite, granite setts, granite, limestone and slag chippings, grit kerbs, and steam road rolling, for the urban district council.—Mr. J. H. Heyes, clerk.

SURREY.—February 23rd. For the supply of steam rollers and water carts, for the county council.—Mr. A. Dryland, county surveyor, County Hall, Kingston upon Thames.

MUTFORD.—February 24th. For making up two roads, for the rural district council. The Surveyor.

Sanitary.

MANCHESTER.—February 1st. For the construction of a connection with Middleton sewers, for the corporation.—City Surveyor, Town Hall.

ROWLEY REGIS.—February 2nd.—For scavenging work, for the urban district council.—Mr. D. Wright, clerk, Council House, Old Hill, Staffs.

BUCKLOW.—February 2nd—17th.—For the construction of tanks and engine house at the sewage disposal works, for the rural district council.—Mr. J. Mc. D. McKenzie, Station Buildings, Altrincham.

IRVINESTOWN.—February 2nd.—For sewerage works, for the rural district council.—Mr. T. Aiken, clerk, Board Room, Irvinestown, Ireland.

LLANDAFF.—February 3rd.—For the construction of cast-iron and earthenware pipe sewer, for the rural district council.—Mr. J. Holden, engineer, Park House, 20 Park-place, Cardiff.

HALIFAX.—February 6th.—For the construction of an earthenware pipe sewer, for the corporation. Mr. J. Lord, borough engineer.

COTTINGHAM.—February 8th.—For reconstructing brick outfall sewer and manholes, for the urban district council.—Mr. J. H. Hanson, surveyor.

ALNWICK.—February 8th.—For supplying and laying earthenware pipes, for the rural district council.—Mr. F. Wade, Embleton.

LEEDS.—February 8th.—For the supply of cement, earthenware drain pipes, sewer ironwork, galvanised dirt boxes, and sewer ventilating columns, for the corporation.—Mr. W. T. Lancashire, city engineer, Municipal Buildings.

BLAYDON.—February 9th.—For scavenging work, for the urban district council.—Mr. R. Biggins, Council Offices.

HOUGHTON-LE-SPRING.—February 10th.—For work of scavenging, for the rural district council.—Mr. W. Morley, sanitary inspector, Sunderland-street.

PENYBONT.—February 12th.—For scavenging work in certain parishes, for the rural district council.—Mr. E. W. Davies, sanitary inspector, Bryn-road, Tondu.

WIRRAL.—February 12th.—For the construction of stoneware pipe sewers and other works, for the rural district council.—Mr. W. W. Shennan, 9 Hamilton-square, Birkenhead.

RADCLIFFE—BURY.—February 13th.—For the extension of the sewerage system, for the Radcliffe Urban District Council and the Bury Rural District Council.—Mr. W. L. Rothwell, engineer, Radcliffe.

HAMBLEDON.—February 13th.—For the removal of refuse, for the rural district council.—Mr. F. Smallpeice, clerk, 138 High-street, Guildford.

MANCHESTER.—February 13th—27th.—For sewage disposal works extension, for the Rivers Department.—The Secretary, Rivers Department, Town Hall.

BLEAN.—February 15th.—For the construction of stoneware pipe sewers, manholes, and other works, for the rural district council.—Mr. F. A. Ward, engineer, Roseneath, Eddington.

WOKING.—February 22nd.—For the construction of three screening chambers and detritus tanks, three sedimentation tanks, fifteen circular bacteria beds, provided with automatic distributors, six humus tanks, various lengths of effluent carriers, engine-house, sludge pump and press-house, and engine-houses for driving screens and pumping humus, and other works, for the urban district council.—Mr. G. Mitchell, Engineer, Queen Anne's Mansions, Westminster, S.W.

Stores.

OSSETT.—February 1st.—For the supply of materials, stores, and workmen's tools required in the highways, gas, lighting, water, sanitary and educational departments, for the corporation.—Borough Surveyor.

YORK.—February 1st. For the supply of Portland cement, pitch and creosote oil, stoneware pipes, building lime, Yorkshire stone flags, kerbing and edging, whinstone and limestone chippings, for the corporation.—Mr. F. W. Spurr, city engineer.

PLNGE.—February 6th. For the supply of artificial stone, creosote, disinfectants, drivers' flats, sand, gravel and ballast, tarred granite, cement and lime, granite macadam and hopping, stables and hopping blocks, for the urban district council. The Surveyor, Town Hall, Anerley, London, S.E.

CLEETHORPES.—February 8th. For the supply of chalk, granite, concrete flags, bottoming macadam, hopping macadam, stone kerb, granite kerb, channel, granite radius kerb, granite radius channel, stoneware pipes, new iron, tendered pipes and sanitary pipes, for the urban district council.—Mr. C. H. Wattam, Council House, Cleethorpes.

WOOLWICH.—February 10th.—For the supply of ballast, sand, brooms, brushes, cement, coal, drain pipes, forage, granite kerb, harness, ironmongery, road material, sewer ironwork, and timber, for the borough council.—Mr. J. Ewen Dyson, borough engineer, Town Hall, Woolwich.

RICHMOND (Surrey).—February 12th.—For the supply of [illegible] ironmongery, bass brooms, brushes, granite, granite setts, broken chalk, [illegible] granite kerb, channel, [illegible] Portland cement, grey lime, artificial stone paving, harness, stable requisites, tar, tarred macadam, wood blocks, oils and paints, for the corporation.—Mr. J. H. Brierley, borough surveyor.

HALIFAX.—February 12th. For the supply of paving setts, flags, kerb, granite, limestone chippings, lime, Portland cement, gravel, sand, earthenware pipes, granite paving setts, artificial flags, horse provender, coal, casting- (manhole covers, gullies, and name plates), wrought iron, shovels, picks, ironmongery, oils, paints, candles, gunpowder, cotton waste, gaskin, brooms, brushes, timber, precipitants for sewage [illegible] and labour, for the corporation.—Mr. James Lord, borough engineer.

ECCLES.—February 15th. For the supply of flags, kerbs, broken rubble, broken slag, granite macadam and chippings, prepared tar slag, prepared tar limestone, limestone cube chippings, gravel, cinders, castings, pitch, creosote, tar, Simpson's patent street [illegible] stoneware pipes, [illegible] bends and junctions, mortar, and channel stones, for the corporation.—Mr. Thomas S. Picton, borough surveyor, Eccles.

SURBITON.—February 15th. For the supply of team labour, broken Guernsey granite, concrete paving flags, general stores, repairing burst and damaged water pipes, cast-iron goods, tools, smiths' work, Derbyshire limestone, tar-paving materials, house refuse removal, Newry granite kerbing, Newry granite paving setts, Kent flints, gravel, Thames ballast, scavenging, slag tarred macadam, scavengers' brooms, horse sweeping brooms, machine brooms, lubricating oils, and sludge press cloth, for the urban district council. The Surveyor, Council Offices, Ewell-road, Surbiton.

SOUTHEND-ON-SEA.—February 24th. For the supply of stoneware pipes, bends, flints, bricks, gravel, sand, timber, ironmongery, paints, oils, colours, cement, lime, chalk, team labour, forage, tar-paving, tar-macadam, iron castings, granite kerb, channel, broken Guernsey granite, broken granite, pitch, creosote oil, harness supplies, sundries, brooms, brushes, steel, iron, and disinfectants, for the corporation.—Mr. Ernest J. Elford, borough engineer.

EPSOM.—March 9th. For the supply of [illegible] ironwork, gully gratings, shovels, picks, brooms, forks, dust skeps, disinfectants, Portland cement, stoneware pipes and gullies, kerbing and channelling, setts, broken granite, chippings and limestone dust, tar-paving and tar-macadam, coal and coke, hay, corn, bran, straw, bricks, paraffin, artificial stone paving, Thames ballast, Thames sand, veterinary surgeon's services, tar, pitch, and team labour, for the urban district council.—Mr. Edward R. Capon, surveyor, Bromley Hurst, Church-street, Epsom.

Miscellaneous.

OXFORD.—Offers for steel rails and paving setts which have been in use on the tramways.—City Engineer.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyors readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance. ‡ Provisionally accepted.

LISTER & WICH [illegible]
[illegible] for the urban [illegible] and sand and gravel.
G. Bowen, Aston [illegible]
J. Farrell, Blackpool [illegible] 11,763
W. Grierson, Bolton [illegible] 11,
P. Palmer, Lytham [illegible] 11,595
E. Fielden & Son, Burnley [illegible] 11,
W. Shepherd & Son, [illegible] 11,230
J. E. Hopper, Rochdale [illegible] 11,
J. E. Crisp, Stalybridge [illegible]
E. Taylor, Limited, Blackpool [illegible]
S. Haywood, Blackburn [illegible]

EUSTON. Accepted for the supply of [illegible] the rural district council. Mr. H. Stevenson, [illegible]
Lindsay and Stevenson, Grimsby, [illegible] Limited, Leicester. Yorkshire [illegible] per ton.
H. Lee, Iron Company, Limited, Bolton, [illegible] Yorkshire prices per ton.

CHEPPING WYCOMBE. For the supply of [illegible] concrete kerbs, [illegible] granite setts, [illegible] [illegible] the corporation. Mr. F. [illegible] surveyor:—
[illegible]

CONWAY. For [illegible] the rural district council. Mr. T. L. Oliver, engineer:—
[illegible]

[illegible] 4s. 6d. per ton.
It was stated that the tenders stipulated that all carmen

[illegible] Per gallon
d.
[illegible]
Clayton, Limited, London [illegible]
[illegible]

CONSETT. [illegible] under the Private Street Works Act, 1892, for the rural district council. [illegible] surveyor:—
R. Armitage, Leeds [illegible]
W. R. Unwin, Ecclesfield [illegible]
J. Bartram, Sheffield [illegible]
E. Streets, Sheffield [illegible]
H. Hawksworth, Sheffield [illegible]
F. Frost, Sheffield [illegible]

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JANUARY

[illegible] Town Planning Institute. [illegible] The Urban Land Problem. [illegible] 9.30 p.m. 20 Victoria-street, S.W.

30. Institution of Municipal and County Engineers. Eastern District Meeting at Doncaster.

FEBRUARY

4. Society of [illegible] Mr. Norman S. [illegible] Engineer of Railways, delivers [illegible] Presentation of Premiums. 7.30 p.m.
[illegible] Institution of Mechanical Engineers. [illegible] 8 p.m.

5. Institution of Municipal and County Engineers at 92 Victoria-street, S.W. [illegible]

13. Institution of Municipal Engineers. [illegible] Annual Dinner, Newcastle-on-Tyne.

19-20. Royal Sanitary Institute. Meeting at Manchester.

23.—County Councils Association: Annual Meeting. 3 p.m.

APPOINTMENTS OPEN.

COUNTY COUNCIL OF NOTTS.
APPOINTMENT OF COUNTY SURVEYOR.

The County Council of Notts are desirous of receiving applications for the office of County Surveyor. The person appointed will be required to reside in or near to the Town of Nottingham, and to devote the whole of his time to the discharge of the duties of the office. He will not be allowed to engage in any private practice.

The salary will be £750 per annum, and, in addition, travelling expenses will be paid.

Applications, marked "County Surveyor," with copies of not more than three recent testimonials, must be made upon Forms which will be forwarded by me upon receipt of an addressed foolscap envelope.

The applications must reach me not later than midday on Saturday, the 27th day of February, 1915.

Canvassing is strictly prohibited, and will be deemed a disqualification.

(By order)
H. HAMPTON COPNALL,
Clerk of the County Council.

Shire Hall,
Nottingham.
February, 1915. (2,304)

(Continued on p. xl.)

MISCELLANEOUS.

WANTED, at once, good Second-hand Contractor's Level, with Staffs and Legs complete.—Sanders & Torrance, Contractors, Stoke-on-Trent. (2,310)

(Continued on p. xlviii.)

TENDERS WANTED.

BOROUGH OF SHREWSBURY.
ANNUAL SUPPLIES.

Tenders are invited for the Supply and Delivery of the undermentioned Materials for the year ending March 31st, 1916—viz.:—

1. Broken Macadam.
2. Tarred Granite Macadam.
3. Tarred Slag.
4. Broken Slag.
5. Tar-spraying.
6. Distilled Tar.
7. Crossing Blocks.
8. Yorkshire or Lancashire Kerbs, Flags, and Channels.
9. Concrete Flags.

Specifications and Forms of Tender may be obtained on application to the undersigned, to whom sealed and suitably endorsed Tenders should be delivered not later than first post on Wednesday, February 17th, 1915.

The Corporation do not bind themselves to accept the Lowest or any Tender.

V. W. WARD, ASSOC.M.INST.C.E.,
Borough Surveyor.

The Square,
Shrewsbury.
January 27, 1915. (2,303)

CLEETHORPES URBAN DISTRICT COUNCIL.

The above Council invite Tenders for the Supply of the following Materials for a period ending 31st March, 1916

1. Chalk. 2. Granite. 3. 2-in. Concrete Flags. 4. Bottoming Tar-macadam. 5. Topping Tar-macadam. 6. Straight York Kerb. 7. Straight York Channel. 8. Granite Radius Kerb. 9. Granite Radius Channel. 10. 9-in. Ordinary Pipes. 11. New Gullies. 12. 6-in. Stanford Pipes. 13. Ordinary Pipes.

Specifications, Schedules and Forms of Tender may be obtained on application to Mr. C. H. Waithman, ASSOC.M.INST.C.E., Council House, Cleethorpes.

Sealed Tenders, endorsed "Material. Contract No. ——," addressed to the undersigned, to be delivered to this Office not later than 12 o'clock noon on Monday, the 8th day of February, 1915.

B. GREAVES,
Clerk to the Council.

Council Offices,
Cleethorpes.
January 27, 1915. 2,30[illegible]

COUNTY BOROUGH OF HALIFAX.
HIGHWAYS COMMITTEE.

Tenders are invited for the Supply of the following Stores and Materials required in the Highways Department of the Halifax Corporation during the 12 months ending 31st March, 1916—viz.:—

Schedule No.
1. Paving Setts, Flags, Kerb, &c.
2. Granite, Limestone Chippings, and Lime.
3. Portland Cement.
4. Gravel and Sand.
5. Earthenware Pipes.
6. Granite Paving Setts.
7. Artificial Flags.
8. Horse Provender.
9. Coal (in small quantities).
10. Castings (Manhole Covers, Gullies, and Name Plates).
11. Wrought Iron, Shovels, Picks, Ironmongery, &c.
12. Oils, Paints, Candles, Gunpowder, &c.
13. Cotton Waste and Gaskin.
14. Brooms and Brushes.
15. Timber.
16. Precipitants for Sewage.
17. Filter Cloths for Sludge Pressing.
18. Team Labour.

Forms of Tender, Specifications, and further particulars may be obtained on application to Mr. James Lord, M.INST.C.E., Borough Engineer, Halifax. Intending Contractors must state the number of Schedule required.

Tenders, in the envelope provided, must be sent to the undersigned not later than 12 o'clock noon on Saturday, the 13th February, 1915.

Any Sample submitted by the Tenderers (which will not be paid for by the Corporation) must be marked "Sample, Tender for Highway Stores," and sent to the Borough Engineer, Town Hall, Halifax.

The persons whose Tenders are accepted (except as to Coal) will be required to observe the Fair Contracts Clauses adopted by the Corporation.

The Committee do not bind themselves to accept the lowest or any Tender.

(By order)
PERCY SAUNDERS,
Town Clerk.

Town Hall, Halifax.
January 27, 1915. (2,307)

KEYNSHAM RURAL DISTRICT COUNCIL.
SUPPLY OF MATERIAL, 1915-16.

The above Council invite Tenders for the Supply of Granite or Basalt, Limestone, and Tarred Macadam, delivered to the various Stations in the District, for the year ending March 31, 1916.

Forms of Tender and Specifications can be obtained from the undersigned.

Tenders, endorsed "Supply of Road Material," are to be delivered to F. G. Whittuck, Esq., Clerk to the District Council, Keynsham, on or before Friday, the 12th February, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

J. JOHNSON,
Surveyor of Highways.

Surveyor's Office,
Keynsham,
Bristol.
January 26, 1915. (2,302)

KEYNSHAM RURAL DISTRICT COUNCIL.
STEAM ROLLING.

The above Council invite Tenders for the Supply on Hire of two or more Steam Rollers and Scarifiers for use on their main and district roads for one, two, or three years, commencing from the 1st April, 1915.

Specifications can be obtained from the undersigned.

Tenders, endorsed "Steam Rolling," are to be delivered to F. G. Whittuck, Esq., Clerk to the District Council, Keynsham, on or before Friday, the 12th February, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

J. JOHNSON,
Surveyor of Highways.

Surveyor's Office,
Keynsham,
Bristol.
January 26, 1915. 2,301

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. FEBRUARY 5, 1915. No. 1,203.

Minutes of Proceedings.

Urban Land and Town Planning.

At the last meeting of the Town Planning Institute the relationship between the urban land problem and town planning was discussed on an interesting paper by Prof. S. D. Adshead, F.R.I.B.A., some extracts from which will be found in another column. The paper was loosely divided into two parts, dealing respectively with the acquisition and utilisation of urban areas. It is manifestly a difficult matter to determine what is a fair price to be paid to the owner when urban land is required for public purposes and many of the unsatisfactory features of the procedure at present available were clearly pointed out by Prof. Adshead. In regard both to the matters which have been held to be proper subjects for compensation and to the basis upon which compensation is assessed the procedure has been found on the whole to err on the side of generosity to the owner. We venture to think, however, that the statement that the 10 per cent which is invariably added to the ascertained price "has no calculable asset whatever" may be based upon a misapprehension. It is true that to-day it is added mechanically and as a matter of course, but it had its origin in compensation for disturbance of capital and the variations in the money market and suitable opportunities for investment, and until the 10 per cent became stereotyped evidence was frequently given at great length in regard to these matters. We are not defending the present use of the 10 per cent, but merely pointing out that historically it has an intelligible meaning. Prof. Adshead further points out that under the Lands Clauses Acts an owner cannot be compelled to sell part of a structure if he is able and willing to sell the whole, even though the whole may not be required. Cases of this class are always difficult to deal with, and have been the subject of almost all the litigation which has resulted from the operation of Michael Angelo Taylor's Act, which is applicable to street widenings in the metropolis. The effect of the decisions under that ancient statute is that if the local authority seek to take part only of a house they may be compelled to take the whole of the less of what they really require will destroy the identity of the house as a house. On the other hand, they may be restrained by injunction from acquiring the whole of a house if part only is required for the widening and the owner is desirous of retaining the remainder. It is not easy to see how the difficulty of such cases can be surmounted in a better or fairer way than that provided by the Lands Clauses Acts.

Dealing next with the utilisation of urban land, Prof. Adshead entered a plea for a Town Planning Act with reference to built-up urban areas, and suggested that local authorities should have power of control over the reconstruction of properties lying on the sides of [illegible] streets and over the class and character of new buildings to be erected in [illegible]. The latter part of the paper was concerned with urban housing. An examination of the comparative merits of block buildings and separate cottages led, of course, to the conclusion that, apart from the argument from necessity, the separate cottage is in every way preferable. There followed some trenchant criticisms of existing by-laws, a plea for greater elasticity, and an examination of the types of cottages suggested in the Memorandum issued by the Local Government Board last year. Prof. Adshead finally asked the question, Who is to be responsible for the design and erection of these working-class cottages which local authorities are authorised and encouraged to erect? The answer given was, Not the municipal engineer, but the architect! "The work of the municipal engineer is closely connected with that of the architect in so far as they are both concerned with the mixing of concrete and the erection of a brick wall, but the partnership separates here. For the [illegible] the ability of the untrained practitioner added to the experience of the observant amateur." This sounds to us like the language of disappointment, and inasmuch as the Local Government Board have stated—as Prof. Adshead points out—that houses erected by a local authority ought generally to be such as will be a model or standard for houses for the working classes which may be erected by private persons (and, we may add, designed by private architect(s), and further that the erection of such cottages by local authorities has in many cases, in fact, caused an improvement in the standard of private building, municipal engineers will know what value to place upon this professional dictum.

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The Future of Municipal Engineering.

In his inaugural address as president of the Society of Engineers last Monday evening, Mr Norman Scorgie, borough engineer of Hackney, dealt with some of the principal changes that have occurred in municipal engineering work during the past twelve years, and made some attempt to penetrate into the future. In confining himself to a broad survey, and avoiding the discussion of details, the new president probably adopted a wise course, his task being to interpret to an audience representative of every class of engineering practice the main features of the present situation in regard to municipal work. The first point to which attention was drawn was the com-

parative rarity of the specialist in the field of municipal engineering. In all the larger commercial undertakings the specialist reigns supreme, but the more or less arbitrary division of the country into "districts" for local government purposes has retained for the municipal engineer an extraordinarily wide range of duties. True, there is a certain tendency to-day towards the combination of districts for special purposes, but with the removal of certain obstacles we are convinced that the future will witness a very large extension of the principle of co-operation between neighbouring authorities. The next important sign of the times to which Mr. Scorgie referred was the decay of the idea that the spending of public money is always an evil to be avoided, if possible. Indeed, in certain quarters to-day the opposite extreme has to be guarded against. In this connection we cordially support the protest made in the address against the misleading division of municipal expenditure into productive and unproductive. There are still to be found many whose souls are so far in the grip of mammon that they are totally unable to conceive the idea of an undertaking being really "productive" or "profitable" to the community in the absence of a monetary dividend. This attitude of mind can only be combated by continually insisting upon the benefits derived by the community in the way of improved health and conditions of living by a judicious expenditure upon sanitation, water supply, and kindred works.

Mr. Scorgie next turned to the consideration of the question whether the present wide scope of municipal engineering is likely to be a permanent condition, which he answered by a partial negative. We have already alluded to the modern tendency towards co-operation, and it follows that, with larger areas, there will be much greater scope for the employment of the whole-time specialist. In the great centres of population, however, still greater developments are possible in the direction of complete municipal federation. The whole idea of the federal system of government, whether municipal or national, is to reconcile local jealousies with a growing sense of unity. The question arises in its most acute form in the problem of Greater London, but it appears that it is also becoming an issue in current municipal politics in the Manchester district and elsewhere. It will thus be seen that signs are not wanting of future changes of a fundamental character in our system of local government. In our opinion Mr. Scorgie, in his address, took a statesmanlike view of the present situation, and although it will probably be many years before the influences at work come to fruition, it is well to remind ourselves that there is no inherent or absolute permanence in institutions, which we are apt to find it difficult to view in their true perspective owing to their very proximity.

* * *

Mechanical Filtration.

Mechanical filtration has recently been dealt with very fully by the *Engineering Record* of New York. Owing to the difficulties encountered in the underdraining, washing, and air-pressure systems in use, and to the difference in opinion existing among engineers, several operators and engineers were asked to give their views and experiences. The essential difference between the mechanical filter and the ordinary sand filter is in the washing and agitation of the sand by means of air and wash-water forced in below the sand layer; thus the underdrain practice is the most important matter in relation to the subject of mechanical filtration. It is possible to pass water through a 30-in. layer of sand at a quick rate according to the pressure due to the head of water, but the sand is naturally clogged thereby at a quicker rate, and needs to be cleaned. In order to clean the sand, water was admitted below the sand layer. The simplest form of filter generally had a false bottom of perforated metal, upon which rested the sand sometimes or a layer of gravel. When water was admitted below the false bottom it was apt to result in unequal distribution, especially with high pressure. Thus some form of agitator was found to be necessary in order to clean the sand, and mechanical and air agitators were used. As an improvement a system of channels, upon which perforated grids were fixed, was invented, and the water was admitted at many points, thus giving a better distribution of wash-water. Air agitation of the sand was introduced, compressed air being admitted under the strainers, passed up through the gravel and agitated the sand, washing being thereby facilitated. This sometimes had the effect of displacing the gravel, and it was sought to overcome the difficulty by increasing the depth of the gravel or by fixing screens above the gravel. Another plan was to discharge the air above the gravel layer. The velocity of the flow of the wash-water has generally been too low to clean the filter, unless the sand were disturbed by air pressure or by mechanical means, but in the more modern system a higher velocity of the wash-water has been given, and this gives such a good result that agitation by the wash-water currents is so satisfactory that other methods of agitation are unnecessary.

The use of high wash-water velocities has made some method of keeping the gravel in place necessary, and thus great attention has been given to the perfecting of methods. Several points have to be borne carefully in mind. The sand must not be washed away, although it must be thoroughly agitated and cleaned. The gravel layer must not be disturbed, and the sand must not pass through the gravel layer into the underdrains. Some difficulty has also been experienced through strainers coming loose or wearing out, while an uneven surface at the side of the tank may cause the formation of a ring of clogged sand, which cannot be easily removed. The filters, first made in circular iron or wooden tanks, are now generally made in rectangular concrete tanks in the case of large installations, so that care is required in forming the interior surface is obvious. It must not be supposed because the construction of mechanical filters has been perfected that those filters put in ten years ago have proved to be unsatisfactory. On the contrary, it is remarkable that the shortcomings reported are of minor importance, and that excellent results have generally been obtained. There is every reason to suppose that with the perfection of designs the economical working of the system will be improved.

* * *

A Filing System.

In these days, when articles are being written in technical journals and papers are being read before the various professional societies upon almost every conceivable variety of subject of any interest, direct or indirect, to engineers, it is impossible to complain that the experience of each member of the profession is not at the disposal of his brethren. The very magnitude of the flow of literature, however, may render the individual productions useless by being lost in the mass unless some system of filing and indexing is adopted. To this end various devices have been tried, but we do not remember to have seen any which combines simplicity with completeness to the same degree as that submitted to us by Mr. James Eastwood, the engineer to the Sowerby Bridge Urban District Council. The characteristic part of his plan is the use of the card index. If, for example, an article can be briefly summarised, such a summary is made on one of the

roads and filed away alphabetically. The method may be illustrated by the following examples:

HIGHWAYS.

Dedication of Subsoil.

THE SURVEYOR, Vol. xlvi., December 18, 1914, p. 702, leading article.

Landowner dedicating highway does not part with ownership of soil. Still entitled to minerals which do not prevent use of public right of way, but subject to the Public Health Act, 1875, s. 149. He can remove timber, and can prevent pipes being laid in it except under statutory powers—*e.g.*, pipes for pumping [illegible] (*Wolf Cub Colliery v. Hornby*, 61 J.P., 375).

Also see *Tithe Redemption Commission v. Runston*, 14 Ch. D., 706).

Also as to underground [illegible] (*Baird v. Fenton*, 8 H. & C., 394, 1859, 2 Q.B., 367).

Authority can prevent pipes and wires being laid in street without their consent, but if pipes, &c., are laid before they can interfere, they cannot order their removal, but can prevent road being opened for their repair.

If an article should be [illegible] the entry on the card is confined to the title and a brief indication of the scope of the article.

SEWAGE DISPOSAL.

Recent Study.

Paper by Edward Ardern, M.Sc., F.I.C., read at the annual meeting of Sewage Works Managers (THE SURVEYOR, Vol. xlvi., December 18, 1914, p. 714, and leading article, p. 702), gives results of experiments at Manchester and Salford.

Also discussion on above paper (December 25, 1914, p. 754).

With suitable conditions an entirely satisfactory effluent could be obtained with Manchester sewage in intimate contact with a quarter of its volume of activated sludge [illegible] six hours. The initial production of activated sludge took three to four days. [illegible] treatment from an engineering standpoint as to cost.

Similarly, newspaper cuttings may be filed by pasting them on to the cards at [illegible] should, of course, be [illegible]. The thanks of himself and his readers are due to Mr. Eastwood for placing [illegible] at our disposal.

* * *

Extraordinary Traffic.

In [illegible] articles on the subject of extraordinary traffic which have been published from time to time in these columns we have endeavoured to guide the municipal engineer through the intricacies of some of the leading decisions of the courts. We cannot help feeling, however, that the surveyor to a local authority, the issue of whose formal certificate is a condition precedent to the recovery of expenses, has at least equal interest in some practical aspects of the question as he has in the subtleties of legal argument. In emphasising this point of view, the paper which was read before the Institution of Municipal and County Engineers at Doncaster by Mr. F. Oscar Kirby, the borough engineer, has a special value. The difficulty of deciding in any given case whether traffic is or is not extraordinary has been considerably increased of late by the growing use of traction engines and heavy locomotives. Once satisfied on this point, however, the duty of the surveyor is to keep observation and subsequently to issue his certificate. The several points to be borne in mind in the discharge of this responsibility are clearly and concisely brought out in Mr. Kirby's paper, which will be found in another column, and cannot well be further summarised. We may say, however, that we have considerable sympathy with the suggestion that some compensation should be made to those highway authorities whose roads have been substantially damaged by traffic of a military character during the past few months. This traffic is certainly "extraordinary," and it is a little difficult to see why the cost of this part of the mobilisation should fall upon the ratepayers of the districts affected. The whole question of extraordinary traffic is very involved, and we fully agree with Mr. Kirby that if anything can be done by amendment of the law to facilitate the recovery of expense with which local authorities are saddled, and to render [illegible] the highway administration, it is desirable that the powers that be, and in particular the institution, should take the necessary steps without delay.

* * *

Standard Pipe Flanges.

Among the most useful investigations undertaken by the Engineering Standards Committee a place must be given to the inquiries of the Sectional Committee on pipe flanges, the conclusions of which were embodied in a report published towards the end of 1904. The work of the committee necessarily demanded the careful consideration of a number of points of detail, in regard to some of which interesting experiments have since been conducted by Mr. John Dewrance. A paper on the "Standardisation of Pipe Flanges and Flanged Fittings," which that gentleman read at the last meeting of the Institution of Mechanical Engineers, [illegible] of peculiar interest. In concluding, the author pointed out that some manufacturers hold that by using their own standard sizes of flanges they influence their customers to come to them for renewals and additions of plant; but as they must also be prepared to supply to British standard sizes, it is probable that any advantage they gain by retaining their own standard is counterbalanced by the extra cost of using two standards. In cases of breakdown the enormous advantage to large users of machinery of a standard cannot in general be over-estimated. Fittings of subsidiary machinery can in emergency be transferred to the most important uses. Spares are fewer and more generally useful, and renewals can often be obtained from stock; whereas special flanges require special fittings throughout, and this, in the case of cast steel, [illegible] The British standard for pipe flanges is certainly the most largely adopted at the present time, and Mr. Dewrance suggested to those members of the institution who have not already adopted it that they should give the matter their careful consideration.

* * *

The London Electricity Scheme.

The electricity scheme of the London County Council is very generally condemned by the local authorities in the area affected by its provisions, and a conference of metropolitan borough councils owning electricity undertakings has prepared a report in which the proposed scheme is criticised in detail. The conclusions arrived at, briefly summarised, are that, given fair play and an equal opportunity, the present authorised distributors feel that they are capable of rendering yet greater service in the future. They describe the new proposals as hazardous from a financial point of view, as subversive of municipal independence, as achieving so little by endangering so much, and they state that they are the less called for, inasmuch as an outline of means is contained in existing legislation which, if pursued and developed, is capable of dealing with all the evils alleged. The opposition to the London County Council enterprise outside the council chamber is without doubt a very powerful one, and inasmuch as upon this occasion it is unaffected by party considerations, its influence upon the ultimate fate of the scheme was bound to be considerable. It was indeed so powerful that at the London County Council meeting on Tuesday the majority necessary failed to confirm the recommendation to proceed with the Bill, which will not, therefore, come before Parliament this session.

The Treatment of Waste Liquors from Tin-plating and Galvanising Works.—(4.)

By G. BERTRAM KERSHAW, M.AM.SOC.C.E., M.INST.C.E., Late Engineer to the Royal Commission on Sewage Disposal.

The tin-plating industry is mainly confined to the South Wales district, some 90 per cent of the mill-being situated in the counties of Glamorgan, Carmarthen, and Monmouth, while galvanising forms an important industry at Wolverhampton, Birmingham, and many other Midland towns.

In the galvanising process the plates or articles, after cleansing, are placed in a pickling liquid consisting of sulphuric or hydrochloric acid and water. The acid is then washed from the plates—which are sometimes also scoured with sand and they are dipped into molten zinc. The wastes arising from the discharge of the stale "pickle" and water used for washing the acid from the plates are extremely acid, and require neutralisation by lime and settlement. The waste liquors derived from galvanising are similar to those resulting from tin-plating, and the treatment of the wastes from the two industries may be dealt with conjointly at a later stage.

Tin-plating consists in covering thin sheets of iron or steel with tin, thereby doing away with their liability to rust, as when uncoated.

"Terne" is a term used to denote plates which are covered with a mixture of tin and lead.

Frequently tin-plate works are carried on in conjunction with steel works, the steel being made at the same works where the tin plates are prepared.

The process of manufacture of tin-plates following the production of the steel bars is an interesting one, the various operations being as follows: Bar-cutting, rolling, shearing, opening, black pickling, black annealing, cold rolling, white annealing, white pickling, tinning, cleaning, dusting, sorting and packing.

Bar-cutting and Rolling.—The steel bars, measuring about 7—10 in. wide by ⅝—¾ in. thick, are cut into lengths of about 20 in.; they are then heated to dull red and passed four or five times through chilled cast-iron rolls, when they are returned to the furnace. After reheating they are again passed through the rolls, doubled upon themselves, flattened, and transferred to the finishing furnace for another heat.

Shearing.—When sufficiently hot they are passed through the finishing rolls, and again doubled and flattened, while the edges coming together on the first doubling are sheared off and the pieces returned to the finishing furnace, and, when hot enough, the doubled sheets are once more rolled and doubled, trimmed with the shears, and again returned to the furnace for the final heat, after which they are rolled out to the required length, stacked, and allowed to cool before shearing.

Opening.—Each piece of steel plate (consisting of eight layers) is now cut to the required size for the finished plate, and is then ready for opening. The rolling operations, previously described, have the effect of causing the sheets to adhere to one another, and they have to be separated. This is brought about by vertical cleavage with a special knife.

Black Pickling.—The next process (black pickling) consists in dissolving the oxide of iron from the sheets by means of dilute sulphuric acid in pickling vats. The plates are disposed in bundles on a metal cradle, and immersed in a hot solution of sulphuric acid, the cradle meanwhile being moved backwards and forwards, and the liquor agitated. After remaining in the vat for three or four minutes the plates are transferred to a vat containing tepid water, and they are washed to remove as much acid as possible. Bran and water is thrown into the acid vat, forming a thick froth on the surface of the liquid, and this reduces the rapid evolution of gas which would otherwise occur during pickling.

Black Annealing.—The next process consists of black annealing, to soften the plates and to remove water stain. They are put under a receptacle sealed with sand round the lower edges, placed on a carriage, and run into the annealing furnace, where they remain for about ten hours. After withdrawal from the furnace they are left in the closed receptacle to cool slowly.

Cold Rolling.—The plates are next subjected to cold rolling by passing them under great pressure through polished cast-iron rolls, in order to give them a good surface.

White Annealing.—This is necessary to restore softness and pliability to the plates after cold rolling. During this process the plates are kept in the furnace for about seven hours, but they are exposed to a lower temperature than that employed for black annealing.

White Pickling.—The plates are next white-pickled to remove the oxide scale formed in the last two processes, and this operation resembles that employed for black pickling, but a weaker solution of sulphuric acid is used. The plates, after white pickling, are washed in clean water, and then transferred to a water bath, or "bosh," where they remain immersed until ready for the tinning process.

Tinning.—Tinning is accomplished by passing the plates through the tinning machines, of which there are two types—viz., horizontal and vertical. The former consists of two parts, the tin pot and the wash pot; the molten metal in the latter being kept at a slightly lower temperature than the former. A thin layer of palm oil prevents oxidation of the metal. Other portions of the horizontal machine are the grease pot, the flux box (containing zinc chloride), and the "scruff" box. The plates to be tinned are taken from the water bosh and passed while still wet through the layer of flux into the molten tin. Metal guides direct the plates into rolls, which revolve slowly in the metal of the tin pot. From these rolls the plates are drawn by other rolls through the wash pot and grease pot, emerging brightly coated with tin; the plates are then received by a "riser" and removed for cleaning and dusting, these two operations now being frequently carried out by machinery.

Cleaning and Dusting.—The cleaning machine removes the grease by passing the plates through a bed of absorbent material, while the dusting machine passes the plates between rollers covered with sheepskin, which gives the plates a high polish.

The two remaining processes consist of assorting and packing.

The waste liquors produced bear a strong family resemblance to those coming from galvanising works, and they consist of the liquor from the black and white pickling vats, and the wash waters (sometimes termed "swilling" waters) used for freeing the plates from acid. The pickling liquors are very acid, and contain large quantities of ferrous sulphate, and if they are discharged into streams they coat the bed and sides with a red deposit, killing fish, and destroying all vegetation. Such liquors, when discharged in large volumes into sewers, are injurious by reason of the action of the acid on the joints of the sewer. The waste waters, although less acid than the pickling liquors, are also very injurious to streams; further, they are very large in volume.

After the liquor in the pickling vats has been in use for some time it becomes very strongly impregnated with sulphate of iron, and this is sometimes recovered by evaporation in wooden tanks, lined with lead, scrap-iron sometimes being used to "kill" the acid, the crystals obtained being sold. Much depends upon the market price of copperas as to whether the process is a profitable one or not. When hydrochloric acid is used as a pickle the contents of the pickling vat are rarely recovered. Turner's recovery process for this pickle has been used for some years, and a description of it is given in Naylor's "Trade Wastes."* In this case the substance recovered is oxide of iron, which is very extensively used in making paint.

In cases where both pickle and waste waters are discharged direct to the sewers, it is very desirable that they should be mixed together before their discharge in a suitable storage tank; moreover, the liquors should be neutralised and discharged equally throughout the day, and not run off in sudden flushes. In many cases, however, sewers are not available, and in such cases lime should be added to neutralise the acidity, and the liquid should undergo efficient settle-

* Chas. Griffin & Co., London, 1902.

ment, while sludge-straining tool will be needed once a large quantity of sludge is produced.

Needless to say, however, at the coppersmiths' operation from trouble resulting from the use of sulphuric acid could be carried out wherever practicable since the most serious of the troubles of the water-repellent undertaking. A very important point it may be observed, is likely to result from the neutralisation of the acid, as by this and previously mentioned means would probably be found a solution of the difficulty in this respect.

In some cases spent pickle is returned to the vanisers to the manufacturers of the acid, and Mr. W. C. Heard was asked if the chemical contractors in the Wolverhampton area would undertake the work of neutralising acid at Wolverhampton.

Approximately two-thirds of the total sales anticipated in Wales are expected, and the outbreak of the present war almost brought the industry to a standstill since the Government took an embargo of tin-plates to Holland and Scandinavia has resulted in large stocks being held up in the country.

In his next article Mr. Kershaw will deal with the [illegible] industry.

THE SURVEYORS' INSTITUTION.

PRELIMINARY EXAMINATION, 1915.

The following candidates passed the examination held in the above:

Messrs. H. G. Anthony, Cambridge; D. B. Clarke, J. J. Bevan Lazzer, jun., W. L. Collins, Newport; R. C. Collinge, Dewsbury; L. L. Cossey, Bridgwater; Derby; H. C. Green, Rugby; K. J. Cracknell, North Finchley, N.; L. E. Eagles, Commercial-road, E.; J. W. Edwards, Abergele; H. S. [illegible]; H. Fox, [illegible]; C. [illegible]; D. [illegible]; L. M. Gore, Wembley; C. A. G. [illegible]; J. P. K. [illegible]; Pegram; H. M. Gray, Cranford; H. C. Halliday, Grantham; R. K. Henson, Tonbridge; A. Hodge, Cricklewood, N.W.; G. P. Hopson, Newbury; H. H. Huddy, Little [illegible]; F. T. James, Swansea; H. [illegible], Newport; Miss L. Jennings, Liverpool; G. I. Knowles, Carnforth, Lancs; F. Lee, Mansfield; H. L. Madge, Denmark-hill, S.E.; M. A. Marston, Chelsea, S.W.; W. O. Martin, Caversham; P. Muriel, Bishop's Waltham, Hants; W. Murray-Harris, Balham High-road, S.W.; G. R. Neville, Feltwell, Norfolk; G. F. L. Pelham, Woodford, Essex; W. C. Perkins, St. Germans, Cornwall; N. Petter, Darlington; D. C. Platt, Barnes, S.W.; R. T. Pope, Neath; J. A. Prescott, Lerwick, Caithness-shire; L. Rees, Stoke-on-Trent; R. I. Richards, Blandford; J. E. B. Robson, Dover; E. W. Roper, Weymouth; V. C. C. Smith, Streatham, S.W.; G. F. Sogno, Horsham Road, Sussex; H. R. Strong, Newport, Mon.; A. E. Tilley, Highbury, N.; J. L. Trollope, Banstead, Surrey; C. K. Turner, Worcester; J. R. B. Turner, Loughborough; A. G. West, West Dulwich, S.E.; V. R. Westrope, Ashwell, Herts; C. Wilkins, Longton, Lancs; H. T. Wilkinson, Wellsway, Bath; N. C. Windross, Hessle, East York; G. I. Winterbottom, Bargoed; Hull and W. T. Woodward, Stowmarket.

SCOTTISH CANDIDATES.

Messrs. A. L. Chapman, Lockerbie and C. S. Orr, Glasgow.

IRISH CANDIDATE.

Mr. D. O'Brien, Mitchelstown, co. Cork.

The Supply of Road Materials. It is reported by the borough engineer of Kensington, Mr. A. R. Finch, that for some time past he has been unable to secure a supply of Guernsey granite from the council's contractors, who recently pointed out that they had great difficulty in arranging delivery of sea-borne material. They asked the council to bear some portion of the additional expenditure incurred in executing the orders. The request was not at first entertained, as the council were able to obtain Leicestershire granite, which answered the purpose, at something less than the contract price. The borough engineer now states, however, that it is no longer possible to get a sufficient supply of stone from Leicestershire, owing to the use of the railways for War Office requirements. Granite is urgently required for road reparation works in the borough, and the committee dealing with the matter recommend the council to assent to the payment to the contractors of 1s. per ton in excess of the contract price.

Passed at head of list

CUMBERLAND ROADS AND BRIDGES.

ESTIMATES FOR THE YEAR.

[illegible] Highways Committee of the Cumberland County Council contain the annual estimate of the county surveyor, Mr. William Finch, for 1915-16. The surveyor states that the estimate for maintenance and repair of main roads, as [illegible] adopted, is more than the [illegible] during the past twelve months. The total estimate for this work—viz., £30,700—was £1,700 in excess of last year, chiefly accounted for by the increase in the resurfacing work necessary on important roads which had hitherto been surfaced with inferior stone. The estimate of £30,700 for ordinary maintenance of rural main roads under direct control gave an average cost per mile, exclusive of surface [illegible] throughout the country. Included in the estimates was the sum of £7,530 for laying tar-macadam in various places throughout the county. This amount was £1,070 less than the amount included last year. The estimated [illegible] towards which the surveyor anticipated the Road Board would contribute £3,165, being 75 per cent. A sum of £600 had been again included for tar-spraying certain lengths of road other than those included in the resurfacing programme, and [illegible] that he anticipated a grant would be made by the Road Board of £300.

With regard to the committee's general scheme of resurfacing with approved materials roads which had hitherto been surfaced with inferior limestone and land or river cobbles, there were several lengths of important roads under this classification which it would be essential to resurface next year, and he had included a sum of £18,471 for this work, £11,771 of which was provided for in the ordinary maintenance estimate, thereby entailing an extra cost of about £6,700, and, as hitherto, he anticipated securing a Road Board grant of probably £5,025, provided that those sections were surface treated with tar, the cost of which would be included in the following year's estimates.

Assuming that the Road Board favourably considered [illegible] the amount to be raised by the county council for the maintenance and upkeep of the rural main roads for the ensuing year would be £37,040 (after deducting the estimated Road Board grants mentioned above and amounting to £8,490), or a total increase on the previous year of £1,328. The estimate, inclusive of all surface improvements, gave an average cost per mile of approximately £80. The total estimated cost for main road improvements was £7,355, towards which he estimated that the Road Board would contribute the sum of £1,403, and after other deductions the nett cost to the County Council was £2,072.

The present agreements for the maintenance of main roads in urban areas expired in March next, and the total amount recommended by the sub-committee for the ordinary maintenance of those roads during the next financial year was £6,671, which was an increase of £371 owing to the increased cost of maintenance experienced by almost all the urban authorities. In addition to this amount, the sum of £2,151 was recommended for the extra cost of laying tar-macadam on the main roads within the urban areas in accordance with the practice of the committee during the last two years. The estimated Road Board grant for this work was £1,611, leaving £540 to be provided by the county council, thus making a total estimated cost of urban main roads, after deducting Road Board grants, to the county council of £7,211. After dealing with various items of general expenditure, the county surveyor estimates that the total nett expenditure during the next financial year on the county main roads, bridge roads, and bridges, including grants to local authorities was £56,254.

A Glossary of Road Terms (By H. Percy Boulnois, M.INST.C.E., St. Bride's Press, Limited, 24 Bride-lane, E.C., Price 2s. nett).—The movement towards standardising the principal roads throughout the United Kingdom has rendered it necessary to correlate the nomenclature of road terms in use in different districts, and Mr. Boulnois has compiled a glossary with the hope that it may form a basis for such a correlation.—*Times Engineering Supplement.*

Municipal Engineering.

By NORMAN SCORGIE, M.INST.C.E., Borough Engineer of Hackney.

[Extracts from presidential address delivered before the Society of Engineers on Monday evening last.]

In our time every branch of engineering has become noticeably more intensive, more complex, but municipal engineering has been peculiarly influenced by the aggregation of people in towns, the occupation of whole towns and even groups of towns in particular trades, the modern conditions of transport, and all the other problems that arise from the endless efforts of man to conform to a social environment which is constantly changing, and, of late, changing so rapidly that it seems to have been revolutionised within the five-and-thirty years since I commenced my career in public service.

In these changes municipal engineering has received less relief from specialisation than other branches. Railways and great engineering firms all over the country are introducing more and more specialisation, so that for economy of production and administration brains are being classified and organised as much as labour. But the municipal engineer is denied this relief. Admittedly the larger undertakings, mostly classed as municipal trading, are placed in special hands. The borough engineer is no longer called upon to design a town hall in his spare moments, or to manage a tramway system as a hobby; but this is a limitation on the amount of his work, and not on its range. He must still be architect enough to add to the town hall, or adapt an old one to new uses; he may still have to instal the tramway system, and will certainly be called on for inspiration in any difficulties that arise in its working; he may not have to manufacture gas or electricity, but he has to possess a knowledge of their manufacture and the actual cost of production before he can persuade the gas or electrical engineer to sell them at a fair price for public lighting; he must be something of a bacteriologist to deal with sewage; and more than a little of a lawyer in order to pick holes in the opinions of eminent counsel in matters of public health law; and, finally, in the present year he must be an expert in designing shaded colour schemes for London, and in digging trenches to defeat German howitzers.

Specialisation in Municipal Engineering.

The reasons why municipal engineering has not been specialised are fairly obvious. (I am using this term throughout as a convenient one for civil engineering under local authorities, although they may not be municipalities.) To some extent it may be that a council of voluntary laymen compares unfavourably with a board of paid directors in dealing with administrative reform. It has not the stimulus of trade competition to induce it to take the best advice and the most elaborate pains to effect economies and improvements; and, on the other hand, it has to fear an electorate which, in some instances, is apt to assume that high salaries are necessarily wasteful, and that cheap labour is good labour. But if all this be admitted, it is not a sufficient reason, because the influence of lay control on engineering, whether by public authority or by private directors, is necessarily becoming less as the work of the engineer becomes more technical. The eighteenth century saw the end of the period when a well-educated man might hope for a working knowledge of all professional lore in current use—although, unfortunately, the twentieth century still produces laymen who think they have that knowledge.

The real reason for the difference in this connection between municipal and other engineering seems to me to depend on the nature of the work itself, and the conditions of local government in this country. In commercial engineering a large output is clearly one of the conditions for success, and the impulse to specialise in one particular line can be encouraged, and it is encouraged by studying local resources to such an extent that whole districts are devoted to the manufacture of one particular article; which, as I have already suggested, only increases the difficulties of the unfortunate municipal engineer, who must know the process as thoroughly as the manufacturer himself, in order to make proper sanitary provision for waste products and other special conditions brought about by the trade. Where engineering firms still continue a wide range of output, or where they enter upon new work, such as the armament firms taking up motor-car manufacture, the work is specialised, with separate factories, separately controlled. They may advertise that their motor cars are "built like a Dreadnought," but I venture to question whether the chief naval designer had much to do with them. In the motor-car trade itself, as an example, the tendency is in the direction of specialisation in one design, or, at any rate, a very limited range of models, for each firm. We may deplore this from an uneasy feeling that it will have a paralysing effect on initiative; and we may sincerely hope that it will never attain such dimensions in England as it has in America, so that very obvious errors of design cannot be altered because of the expense of altering machinery dealing with such enormous outputs as one complete motor car every forty seconds. But we must recognise that this tendency is winning on its merits, and endeavour to meet such evils as it brings in its train by striving to improve the status of the engineer so that the designer may have the controlling voice in the factory.

Similarly in railway engineering specialisation increases, although the conditions are different. Railways cannot limit themselves to the carriage of one class of goods, or the design of one type of locomotive, but they can substitute, and are rapidly substituting, delegation for decentralisation. The engineer for the A district and the engineer for the B district are giving place to engineers for this particular work and for that, each over the whole system—such as one for the track only, another for signals and telegraphs, a third for bridges and tunnels.

But local government by small areas makes anything of this sort impossible in municipal engineering. The town council cannot specialise in house refuse, and refuse to scavenge or light the streets, and, on the other hand, it cannot afford, since its area is small, to pay adequate salaries to a number of separate experts. Therefore the municipal engineer is bound to be something of a jack-of-all-trades (although not, I hope, master of none). He must know something of everything and everything of something, be an opportunist, doing his best with the material ready to his hand, hampered on every side by limitations and vested interests. His plant is largely classed as unproductive. His results are increased public convenience and reduced death-rate. They are often very striking, but they are not directly measurable in pounds, shillings and pence; or rather payment is not made directly in those terms to his employers. If a railway engineer can satisfy his directors that a proposed widening will increase earnings, or decrease working expenses by a sufficient amount, they will let him proceed, and if his estimate is sound the board will recoup their outlay and satisfy the shareholders. By elaborate traffic censuses the municipal engineer may prove that a certain road or bridge widening would repay its cost to the public at the very lowest estimate of the loss caused by the present congestion, but (in default of a toll) he cannot produce the money to the town council, or they to the ratepayers.

Municipal Expenditure.

Public expenditure, both national and local, is constantly increasing, and one can see no sign of any check. (I am speaking of the normal conditions before the war.) Old-fashioned ideas of economy have broken down. The public is in revolt against the belief that the spending of money is always an evil to be avoided if possible. There is grave danger that for want of guidance they may incline—indeed they have inclined—to the opposite fallacy that all spending of money as long as it is on public objects is a good thing to be encouraged as much as possible. Ignorant or interested opposition to all municipal enterprise was able to conceal from the public for many years the fact that the value or productiveness of work for the community at large cannot properly be measured in the only term known to private enterprise—a monetary dividend. Now that they

favour are checked by that fraction and the opposition of the company promoting the tramway is discredited. It is naturally difficult to get them to distinguish between the financial and the economical aspects of the case, that municipal work is not as much subject to economic principles as any other form of expenditure. I venture to suggest that every young engineer starting in municipal practice should consider a grounding in the science of economics an important part of his professional training, as it may be some day his duty to advise his council on the economic aspects of any proposal that comes before him, and they may pass on the information to their constituents. Whether it is a new open space or a housing scheme for a slum area, a new system of scavenging, or a new tramway line, or anything involving expenditure within the province of the municipal engineer, it should be possible for him to arrive at the actual gain to the community in terms of money, after making proper deductions for benefits accruing to a particular class only as far as possible under the area of taxation, with a reasonable margin of error, varying according to the information at his disposal, and likely to become less and less if the estimate were properly made in all cases, and statistics accumulated. It is not necessary to extend this return on the capital, good or poor, as the case may be, a perfectly definite thing, although the expenditure may be unproductive in the financial sense. Ten shillings a year saved on the electric bill for each household is as tangible as a ten-shilling reduction in the rate demand note.

I am not posing as an advocate for or against municipal trading, but I am suggesting that the misleading division of municipal expenditure into productive and unproductive is one which the municipal engineer should combat, and in its place he should strive to set up an enlightened public opinion as to the real aims and productiveness of his work. It is public ignorance of the difference in the material results to be expected from it and other forms of engineering which condemns him, on the one hand, to the use of obsolete devices in the interests of so-called economy, and, on the other hand, to embark on unsound schemes for the sake of an immediate profit or saving. It is not possible in the space at my command to elaborate this in detail, but a simple example from the case of a municipal tramway system may illustrate it. Suppose two extensions are proposed—one to an already overcrowded part of the town, the other to a healthy undeveloped part. The first could be worked at a profit from the start, the other not, perhaps, for some years; and yet, if we take into account the decrease in overcrowding and the eventual increase in rateable value, the latter may be the better scheme. Or, again, consider the current assumption that a tramway system in a town of less than 40,000 is bound to be unprofitable. Unless we have carefully considered the extent to which it is patronised, the saving of health in bad weather, the saving in cab fares to the well-to-do, and in time and shoe-leather to the poor, the possible extra employment and increase of population, and many other factors, we are not entitled to make that dogmatic assumption. I do not overlook the factors on the other side that ought to be considered also, particularly the possible unfair incidence of the rate, and the competing claims of the motor bus. I am not trying to solve a problem, but merely to indicate some of the complications in the way of a borough engineer who is honestly striving to make his advice to his council a source of strength and not a string of platitudes.

STATUS.

I have said already that our work, extraordinarily interesting as it sometimes is in its variety, is not work in which one has either the leisure or the inclination for abstract speculation, and I am not going to depart from my own rule except to consider briefly whether the present wide scope of municipal engineering is likely to be a permanent condition.

In recent years it has probably been of some advantage to the profession as a whole that one branch of it should have remained exempt from the increase of specialisation, because specialisation always produces a temporary decline in status. We are apt to value a thing by the price it will fetch, and a man by the salary or fees he can command, and if the work of an engineering post formerly held by one man is split up among several, it is clear that the individual salaries will be smaller and the status of the holders to some extent less than that of their predecessor. It is only a temporary depression, for two reasons: First, if the change is a good one it will lead to such an increase of business that the separate appointments will eventually be worth more than the original one; secondly, and more important, in the case of those firms and public authorities whose work is largely concerned with engineering, the importance of engineering knowledge in high places is becoming more and more recognised, so that, while the purely professional work of a chief engineer may be abolished by the division of it among independent departmental engineers, yet the appointment of an engineer as chief executive officer is becoming usual. The title "engineer and manager" or "engineer and secretary" is now common; even large railway companies have begun to follow foreign example and appoint an engineer as general manager, and under many public authorities (which it would be invidious to mention) the engineer enjoys that most extraordinary proof of status—a higher salary—although the clerk is, by surviving custom or Act of Parliament, the first official.

In any event I do not suggest that this service of unity in a period of temporary disunion, which municipal engineering has done to the profession as a whole, is a permanently valuable one, because I am not among those who think that the status of engineering is permanently at the mercy of anything except the merit of the engineer. One simple safeguard we should have, such as every profession has found necessary for its protection against charlatans—namely, that no one who is not properly qualified should be allowed to call himself an engineer. Beyond that I think we could work out our salvation without the aid of many shibboleths. It may be argued that those professions which by common consent enjoy the highest prestige, such as medicine and law, are protected by elaborate codes of etiquette and internal discipline; but it should be remembered that those codes are late products in professional history. Whatever we may think of their value, they are the devices of a professional class to preserve a position which it has already won on its merits and without their assistance. The lawyer class became influential in England as soon as the legal system developed, because of their superior knowledge of it, and their right of exclusive audience in the courts was the result and not the cause of their influence. And in medicine it is probable that nowadays the surgeon enjoys a slight professional and social precedence over the physician; yet the surgeon is a comparatively new-comer to the medical profession—the common barber promoted. He owes his promotion solely to the merits and exactness of modern surgery. The moral of this on engineering status is important enough to be worth emphasising. It should encourage us to do everything in our power to set a high standard of professional service, and, as the retiring president pointed out in his address last year, of independent service. The value of the doctor's prescription over the patent medicine is partly its independence of trade interest. The barrister has maintained his right of audience when other monopolies have broken down because his services, at his usual fees, are at the disposal of all; he may not refuse a brief or claim a special fee because he does not like a case or a client. These analogies should also save us from depression when we do not see those results which we should like from the activities of this and other engineering societies within the limits of a few years. The village inn-keeper as surveyor of highways some years ago, or even the village cycle-repairer blossoming into the motor engineer of to-day, may seem a low ancestry; but the barber and apothecary was at least as low.

MUNICIPAL FEDERATION.

There are some grounds for suggesting that the exceptional breadth of municipal engineering may pass away, and give place to specialisation to some extent. The co-operation of local authorities for particular purposes has often been encouraged by Parliament. Possibly it is owing to their rather short-sighted reluctance to take advantage of it that the tendency of recent legislation is to ignore the district and the small borough, and make the county and the county borough the only administrative units. There are, however (excluding the main drainage system of London), forty-two joint sewerage boards acting for about 110 local authorities, including such important towns as Birmingham and Brighton.

There are two or three parts of the country in which such population and wealth are gathered together within a limited area that the community could afford to pay for a very considerable amount of special ser-

vice. One of them is London. It finds work for a large number of municipal engineers. In the metropolitan boroughs, where their work is very similar to that of their colleagues in the provinces, and the county boroughs, boroughs and urban districts of Greater London, where it is identical, there are about forty men holding chief appointments, in no way distinguished from one another or from those drawing similar salaries in other parts of the country, yet their collective cost is greater than would seem necessary for London compared with provincial towns on a basis of population, size, rateable value, or even traffic. It is obvious that forty men of similar ability, paid similar salaries, but each a specialist in one class of work, and in charge of that work over the whole of London, would be very much more efficient in themselves at no increase of cost to the public. I am not advocating this as a desirable reform. Specialised efficiency is not popular at the moment because of its supposed identification with German methods, and to say that they would be more efficient in themselves does not prove their ultimate value under popular control. The brain power delivered in the committee room is often heavily reduced by inertia and friction before it reaches the wheels. London suffers from an extraordinary lack of any sense of corporate unity, and, in the absence of that cementing force, it is most probable that local areas under the control of local councils—areas small enough to be conscious of physical unity—in default of anything better, are the best form of government.

Historically the development of London government might have been very different. The ancient city might have extended her boundaries slowly so as to embrace the whole, which would probably have brought about by this time some such system as I have suggested. Alternatively, the outside districts might have been treated less like the cinderellas of local government, and might have adopted a system of federation with better prospects than the Metropolitan Board of Works started with. Federation is the only method of government which the wit of man has yet devised able to reconcile local jealousies with a growing sense of unity. The gradual expansion of the City would have prevented these jealousies arising; but, failing that, it would seem as if federation were the only method by which Londoners could have been brought to believe in London. The creation of a directly elected county council has, unfortunately, only produced twenty-eight examples of the jealousies that commonly exist between any county council and the non-county boroughs within the county. Moreover, it is an inexpansive system. Independent authorities outside a federal scheme will often, in self-interest, elect to come in, but it is impossible to imagine that the boroughs outside the County of London will ever of their own free will come under the control of an external London County Council. Their opposition may postpone the whole question ten or even twenty years, but sooner or later London government will have to be dealt with again, and most probably the next time on federal lines. Federation itself, of course, would not necessarily produce a great amount of specialisation in municipal engineering; but since it almost always leads to closer union, it would probably be a step in that direction.

Municipal federation is also becoming a possibility in other parts of England—for example, in the Birmingham district and in the Manchester district; indeed, in the latter it is almost an issue of current municipal politics.

ROAD MAINTENANCE

But before these tentative influences arising from unity of local interest can affect the profession—that is, the branch of it with which I am dealing—it is likely that another influence, new within the last decade, and arising from a unity of interest all over the country, in urban and rural areas alike, may have a practical effect upon us. I mean the problem of the road. This includes not only the question of road construction and maintenance, but the whole problem of transport, from town planning to traffic regulation.

The advice and complaints of the general public to the road surveyor are no more valuable than other outbursts by "the man in the street" on technical subjects which he does not fully understand. Statements as to the bad condition of roads are often untrue or misleading. The testimony of foreign delegates to the Road Congress in 1913 was that English roads, on the whole, were distinctly superior to Continental ones. This may be discounted, to some extent, as mere politeness to their hosts; but in my own experience, based on considerable road travelling in France and Belgium and in Germany and Austria, no one who has not seen the ordinary condition of the roads which form the suburban approaches to a Continental manufacturing town has any right to call a road bad; and even when a stretch of English road has fallen into a deplorable condition, it is often due to the parsimony or ignorance of the road authority, and not to the incompetence of their surveyor.

But while urging all this it would be idle to deny that for one reason or another road maintenance in this country is a duty which is very unevenly performed, and a burden which is very unevenly distributed under present conditions. The Departmental Committee on Highways (1903) found the roads of England and Wales in the hands of some 1,900 local authorities pursuing widely divergent policies. The recommendations of the committee, which would have introduced a modified nationalisation by Government grants administered through county road boards for the whole of a geographical county (including county boroughs within it) have remained a dead letter through the apathy of the Local Government Board. But with the growing importance of the roads, and their increasing cost, which is now about £15,000,000 a year, and greater than that of any other country, it is inconceivable that any control can long be suffered to remain in the hands, for example, of rural district councils who, in some cases, appoint as their surveyors unqualified persons at salaries as low as £40 a year. Public opinion and recent Parliamentary action seem to be in favour of more centralised control.

The Royal Commission on London Traffic recommended a central traffic board for the whole of the London area, and a reform is none the less a reform because it is overdue. The reasons which led the commissioners to this conclusion for London—namely, the singleness of the object to be attained, and the inability of any existing local authority to command confidence over the whole of Greater London—apply in a greater or less degree to many other large urban areas in the country.

NATIONALISATION OF ROADS

The creation of the Road Board in 1910 is another conspicuous advance in the policy of centralisation, although for the present limited to financial assistance and advisory propaganda. The policy of the board in confining its attentions principally to county main roads may be unfair to the Metropolis, to county boroughs, and to other boroughs and districts in respect to their non-county roads; but a halting or inequitable beginning cannot alter the fact that the nationalisation of the roads has begun. The statutory power of the board to make and maintain roads of their own emphasises this.

Finally, the Government is committed to a policy of fostering co-ordination in regard to town planning schemes, and from fostering to compelling is a short step in twentieth-century political opinion.

All these are reasons for thinking that a very profound change in the position of the municipal engineer may be near at hand. He began as a surveyor of highways; he may likely end as such. If the roads are taken from him the greater part of his daily engineering work will go with them. It is not really a question of taking some roads and leaving others. In urban areas the distinction between the county and non-county road has generally been rather a matter of financial juggling than substantial fact, and what substance there was has vanished with the coming of the motor. The speed of horse-drawn vehicles was so nearly alike, and therefore the loss of time due to congestion so relatively small compared with the total journey, that there was little temptation for a driver to leave the main road for a worse-paved, worse-lighted side route; but with motor traffic there is every inducement to avoid the relatively high loss of time due to congestion. The result is that the so-called side roads may have to bear a great share of the through traffic. Not only pleasure cars seek out such roads, but heavy commercial vehicles also: indeed, the profitable employment of motors for delivery work in particular depends on their ability to maintain a high average speed as a set-off against their great first cost. Even the motor omnibus is taking to the side roads. Those in control of omnibus policy (and there are none shrewder) seem to be satisfied that it is more profitable to run a through, long-distance traffic by [illegible]

in the crowded thoroughfares.

volume and fewer halts. The Roman roads, which

Mr. Norman Scorgie, M.Inst.C.E.
President of the Society of Engineers.

mediate causes of population, have actually led to the most important arteries of the country. In the county of Nottingham a portion of Roman road, derelict but

The existing distinction between main roads and others is most unfair and anomalous. From the decision of the county council as to classification there is no appeal, with the result that enlightened counties "main" all their important roads, whereas others shirk their responsibility, or trifle with it, as a recent example where a county wished to prevent a borough amalgamating with an adjacent urban district to attain county borough size, and was alleged at a Local Government Board inquiry to have "mained" an extensive number of the urban district roads as a bribe to the district to oppose amalgamation, while the revenue for their maintenance came chiefly from the non-county borough.

If a new road engineer displaces the county and the district and the borough surveyor of to-day he will control not only the surface but anything underneath the road. Public opinion is becoming intolerant of the multiplicity of authorities with power to open up a road, and it is difficult to imagine that it would consent to a separation of the highway from the sewerage authority to any great extent. . . .

The road problem seems to have attained the all-engrossing position in municipal engineering that one pictures the battle of the gauges occupying in railway engineering in the forties. The available literature of recent date is truly formidable, but very accessible. I could contribute nothing personal to-night which I have not contributed to recent discussions here and elsewhere and to augment the mass of literature would be a valueless task (even if within my powers) in such a case as we are in a transition stage in which we want evidence, not conclusions. The cry is for a new Macadam; but Macadam spent thirty years in detailed investigation before he

temperament as represented on our highway authorities is one of profound distrust of scientific investsurveyor is sometimes told to stick to old and tried methods even after they have been tried once too often and failed. In order to secure the laying of a in its stability. This, of course, is another argument authority with a small revenue to whom an unfortu-

Mr. Scorgie closed his address with some observations on the administrative system under which municipal engineering has developed to its present important position.

Among those present at the meeting of the Society at which the foregoing address was delivered on Monday evening were Messrs. H. C. H. Shenton (retiring president), C. H. Cooper, borough engineer of Wimbledon, T. Cole (general honorary and consultant secretary to the Institution of Municipal and County Engineers), A. E. Darby, borough engineer of Bethnal Green, Wm. Fairley (Westminster), W. H. Grieves, surveyor to the Sutton, Surrey, Urban District Council, Percy Griffith (Westminster), C. J. Jenkin, surveyor to the Finchley Urban District Council, E. B. B. Newton, borough engineer of Paddington, F. Sadler, engineer and surveyor to the Acton Urban District Council, W. Noble Twelvetrees (past-president) and H. T. Wakelam, county engineer of Middlesex.

PRESENTATION OF PREMIUMS.

The premiums awarded by the council for papers read at meetings and published in the Journal during 1914 were presented by the retiring president, Mr. H. C. H. Shenton, as follows:—

The President's Gold Medal to Mr. A. S. E. Ackermann for his paper on "The Utilisation of Solar Energy."

The Bessemer Premium, value £5 5s., to Mr. A. Stewart Buckle for his paper on "Cylinder Bridge Foundations in the East, and the Construction of the Sittang River Bridge, Burma Railways."

The premium, value £3 3s., for members of affiliated societies, to Mr. R. H. Cunningham for his paper on "Irrigation in India."

A Society's Premium, value £2 2s., to Mr. James Tonge for his paper on "Some Uses of the Hydraulic Mining Cartridge."

VOTES OF THANKS.

A vote of thanks, proposed by Mr. Norman Scorgie, seconded by Mr. W. Noble Twelvetrees, was unanimously accorded to the retiring president, Mr. Shenton, for his services during the past year. Mr. W. B. Esson afterwards proposed, and Mr. Percy Griffith seconded, a vote of thanks to Mr. Scorgie for his address.

THE SOCIETY OF ENGINEERS' NEW PRESIDENT.

Mr. Norman Scorgie has been elected president of the Society of Engineers for the ensuing year. He commenced his professional career under Mr. R. Read, the city surveyor and waterworks engineer of Gloucester. In 1881 he went to England to the borough engineer of Leicester, being appointed four years later resident engineer on the town's flood prevention scheme. In 1886 he was promoted to the position of senior engineering assistant and resident engineer on the new main drainage works, and he superintended, under successive borough engineers, the construction of the whole of the work, with the exception of the first contract, comprised in the engineership of the late Joseph Gordon, which cost £100,000 or more. In 1891 he was appointed engineer and surveyor to the Metropolitan Vestry of Rotherhithe, his appointment to Hackney following five years later. Mr. Scorgie is a member of the Institution of Civil Engineers, and a member of council of the Institution of Municipal and County Engineers.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

PROBLEMS IN MODERN ILLUMINATION.*

By Valentine H. Mackinney.

It is not such an easy matter to say exactly in what good lighting consists. There are, it is true, certain fundamental requirements that must be met. The lights should be sufficient. In an office or workshop, for example, we must provide enough light on the work to enable the workman to do his task in comfort, or the clerk to read and write with perfect ease. We must also provide sufficient general illumination in the room for all surrounding details to be clearly visible. But only long experience can show exactly how much light is needed for different classes of work; and only the skill of the trained lighting expert can secure that in any installation this correct amount will be provided. The illumination should be just right. Too little would be a hindrance to the worker, and therefore uneconomical, too much would be waste.

Another fundamental rule is that the light should be directed where it is needed. This implies two things—that the lights are arranged in the correct positions, and that the lamps are provided with the correct shades or reflectors, screening the light from the eyes of workers and directing the rays just where they are required. Proper shading, in fact, is one of the first requisites in successful illumination. It is not enough merely to provide a bright light. An unshaded source, throwing the light right into the eyes of the worker, instead of on the work he is doing, is a constant source of annoyance; it may even be worse than no light at all. For instance, glaring lights among scaffolding and at the heads of staircases have led men to stumble and thus actually caused accidents.

There are, of course, many special points to be considered. The light should come from the right direction, the shadows should be just right, neither too soft nor too hard, the glassware or metal used with the lamps should be suited to the surroundings. But all these requirements can be met by the trained illuminating engineer.

INTRINSIC BRILLIANCY.

The unpleasant effect of bright light sources in the field of vision is now termed "glare." The glare from an illuminant so used is mainly a function of the "intrinsic brilliancy" of the light source, usually expressed in "candle-power emitted per square inch of projected area." The following table is of interest as showing the intrinsic brilliancy of various modern sources:

Table for Intrinsic Brilliancy for Various Light Sources Now in Use.

Light source	Candle power per sq. in.
Moore tube	0·3—1·75
Frosted electric incandescent lamp	2·5
Candle	3·4
Gas flame	4·8
Oil lamp	7·8
Cooper-Hewitt lamp	1·7
Welsbach gas mantle	20—30
Acetylene burner	75—100
Enclosed A.C. arc lamp	75—200
Enclosed D.C. arc lamp	100—400
Electric lamps—	
Carbon 3·5 watts per candle	475
Carbon 3·1 watts per candle	480
Gem 2·5 watts per candle	625
Tantalum 2·0 watts per candle	750
Tungsten 1·25 watts per candle	875
Tungsten 1·0 watt per candle	1,000
Tungsten half watt	1,600
Sun on horizon	2,000
Flaming arc lamp	3,000
Open arc lamp	4,000—5,000
Open arc crater	100,000
Sun 30° above horizon	500,000
Sun at zenith	600,000

The brightness of the average white sky is about 2·5-candle power per square inch, and many authorities consider that the objects in an artificially lighted room should not be brighter than this.

VARIOUS METHODS OF LIGHTING.

Lighting may be classified in three methods—direct, semi-indirect, and indirect. Of the three, semi-indirect might be considered as the ideal, as with this form one gets the advantage of soft shadows and diffused lighting without the disadvantages of harsher shadows in direct lighting, and the peculiar upside-down or "well effect" of indirect lighting. The "well effect" is more noticeable with indirect lighting should the walls be darker, as one sees the very bright ceiling and dark lower portion of the room. A practical example of this is in the lecture-room of the Institution of Electrical Engineers, London, where the room is lit by concealed cornice lighting, and the walls are of dark mahogany panelling.

For fine work local direct lighting is essential. In connection with libraries, reference-rooms, where one would sit and study at length, local direct lighting is required, while for reading-rooms good general illumination is best, as one would wish to read in comfort, holding the book in any position without obtaining harmful shadows.

In the case of rifle ranges, even lighting of the targets is essential. Should one target be better lit than another it would give competitors undue advantage, and also in this case the lights must of necessity be obscured from view, as any glare would be greatly detrimental to the marksman.

REFLECTION VALUE OF SURROUNDINGS.

In calculating illumination value it is necessary to take into account the effect produced by the light reflected on to the working plane by the surrounding objects. It is quite possible to obtain an increase of as much as 80 per cent in the illumination on a horizontal plane when the room is small and the surroundings light. Speaking broadly, the increase in the actual illumination is as follows:—

Condition of ceiling.	Condition of walls.	Increase over calculated illumination.
		Per cent.
Very dark	Very dark	0
Medium	Very dark	15
Medium	Medium	40
Very light	Very dark	30
Very light	Medium	60
Very light	Very light	80

In very large rooms the effect of reflection from the walls would be less important, although ceiling reflection must be considered. In large spaces, however, the decreased importance of wall reflection is to some extent counterbalanced by the effect of distant light units, their tendency being to improve both the average intensity and the uniformity.

In conclusion, the following simple rules should be observed:

Don't work in a flickering light.

Don't expose the eyes to unshaded lights in the direct range of vision.

Don't judge illumination by the brightness of the lamps.

Avoid extensive contrasts.

Use the right type of globe, shade, or reflector.

Make sure that the illumination is sufficient.

Keep lamps, globes and reflectors clean.

Make sure that lamps are in the right position.

* Extracts from paper read at a meeting of the Institute of Sanitary Engineers on Wednesday evening.

Dangers of Tarred Roads. As the result of a campaign against tarred roads in the Peak district of Derbyshire an influential committee has been appointed to formulate suggestions with a view to placing them before the authorities. The movement is being supported by all the principal farmers and horse-owners in the district, many of whom are stated to have suffered greatly through the condition of the roads.

The Proposed Road from Gower to Penclawdd.—At a meeting of Swansea Rural District Council recently the clerk presented a report of a joint committee of the Swansea and Gower District Councils respecting the proposed road from Gower to Penclawdd, estimated to cost £7,400, towards which the Swansea authority is to contribute £3,000. A committee was appointed to carry through details and application for a grant is to be made to the Road Board.

London County Council Motor Ambulances. The London County Council motor ambulance service was inaugurated this week by the opening of the Fulham station, which will serve the western district of the Metropolis. The need for an up-to-date ambulance service has been a subject of discussion for some time, and in initiating the new service the county council are following the example of the City, which for several years has enjoyed an admirable electric ambulance service. It is intended that in a short time the service will be extended to every district of the Metropolis.

Institution of Municipal and County Engineers.

NORTH-EASTERN DISTRICT MEETING AT DONCASTER.

A meeting of the North-Eastern District of the Institution of Municipal and County Engineers was held at Doncaster last Saturday afternoon. The proceedings, which took place at the Mansion House, were well attended, those present including Messrs. W. J. Steele (Newcastle-upon-Tyne), district chairman, who presided, W. E. H. Burton [illegible] Dearne), W. Fowlds (Keighley), T. Peirson Frank (Newark-on-Trent), Geo. Gledhill (Batley-with-Hexthorpe), W. J. Hadfield (Sheffield), T. H. Hailstone (Birstall), H. Holmes (Ossett), J. D. Kennedy (Retford), A. G. Kilner (Wetherby), F. O. Kirby (Doncaster), C. Lund (Cleckheaton), E. B. Martin (Rotherham), Frank Massie (Wakefield), J. Nuttall (Woodlesford), C. E. Rivers (Harrogate), Leslie Roseveare (South Shields), A. Rothera (Liversedge), F. J. Thrackray (Hoyland Nether), J. P. Wakeford (Wakefield), hon secretary, and C. F. Wike (Sheffield), members; H. P. Foster (Leeds), A. E. Loach (Wakefield), [illegible] borough) and W. A. Walker (Doncaster), students; [illegible] land), visitors.

[illegible]

The [illegible] Mr. E. B. Martin, Mr. Steele, were mixed with a certain amount of [illegible] entered on the minutes.

Mr. [illegible] unanimously.

Mr. [illegible] valued very much the congratulations of his fellow [illegible]

AN APPLICATION FOR MEMBERSHIP.

The CHAIRMAN said he wished to bring before the meeting a matter which involved a matter of principle—an application by a certain gentleman for election as a member of the institution. The applicant at present held the position of a building surveyor and inspector of nuisances under a small urban council, and was in the difficulty that he knew of no one to support his candidature. He was educated at a good school, and he had had a training in an office. His (the chairman's) own view was, if they did not wish to keep down merit, that it was not at all necessary for a man to go through a period of articles if he was a good man otherwise. If a man by his work and intelligence had placed himself in a position to be equal, or possibly superior, to a man who had gone through that period, he did not think they should stand in his way. But the question in that particular case was whether a man who had apparently no other training than that of a building surveyor ought to be a member of the institution.

Mr. E. B. MARTIN (Rotherham) said the council were continually getting applications of this kind, and he suggested that the applicant should be advised to communicate direct with London without troubling about signatures in support of his candidature.

It was resolved that the district secretary should advise the applicant accordingly.

The meeting afterwards proceeded to the consideration of the following papers:—

NOTES ON EXTRAORDINARY TRAFFIC

By F. OSCAR KIRBY, M.Sc., ASSOC.M.INST.C.E., Borough Surveyor, Doncaster.

Despite the change that has taken place in the methods of transport on highways, the percentage of self-propelled vehicles to the total volume of traffic is still comparatively small, and the difficulty has still to be faced of constructing roads which will serve effectively for every kind of traffic.

The damaging effect of traffic is so variable that it is impossible to construct any one road crust suitable to all classes, except at a prohibitive cost, and even then the damage caused by traction engines with barred and studded wheels greatly increases the cost of maintenance. The use on highways of barred and studded tyres, cogged horseshoes, and sharp metal edges has become so common that any suggestion of their prohibition cannot be entertained.

Excessive damage is often done to the surface of highways by the skidding of wheels, which rarely takes place in the case of flexible-tyred wheels, but is the generally adopted method of braking metal-tyred wheels when descending a decline. With a skid-pan the damage is much greater than if a suitable foot-brake were used, which allows the wheels to rotate without skidding. It is well known that the wear on the down-side of an incline caused by [illegible]

Mr. F. [illegible] A.M.I.C.E. ASSOC.M.INST.C.E.

Mr. [illegible] was educated at [illegible] Grammar School. He was articled to his father, the present borough [illegible] and later, after [illegible] engaged as one of [illegible] he was for [illegible] two years assistant [illegible] the late Mr. W. H. [illegible], C.E., and following the latter's death was elected to succeed him in 1906. He has since been responsible for the carrying out of many important public works. Mr. Kirby is a Master of Science of the Victoria University of Manchester, and of the Leeds University, he is also an associate member of the Institution of Civil Engineers, and a member of the Institution of [illegible] and [illegible] Engineers, and of the Institution of Water Engineers.

while on inclines traversed mostly by flexible-tyred wheels the greatest damage takes place on the upside.

The use of a highway in a manner and for purposes for which it is not adapted may cause abnormal damage and wear, and may amount to a nuisance punishable on indictment or restrainable by injunction. Until 1878 a highway could with impunity be subjected to excessive and wholly abnormal wear, provided that a public nuisance was not caused, and by persons not even ratepayers, who might be carrying on business for private gain.

Sec. 23 of the Highways and Locomotives (Amendment) Act, 1878, gave power to local authorities to recover the amount of excess expenditure incurred [illegible] extraordinary traffic, or to enter into an agreement for the payment of a composition in respect of such weight or traffic.

Sec. 12 of the Locomotives Act, 1898, limits the period for the commencement of proceedings for recovery to within twelve months after the damage has been done, or for works extending over a long period to within six months from completion of the work.

I propose to refer very briefly to the working of the provisions of the Highway Acts with regard to extraordinary traffic. It is a subject which has been responsible for a veritable sea of litigation, and many and conflicting legal decisions, and at the present moment the difficulties that govern the question are as great as ever.

In growing districts it is a common occurrence to

see a road cut up for miles by the passage of traction engines in wet weather, or just after a frost, but the difficulty of fixing the blame on any particular train of wheels and bringing the case home to the party responsible is one which often precludes the local authority from taking any action. Similarly, the effect of a traction engine on a newly surfaced length of roadway may, in a single journey, give rise to considerable expense in restoration, which, with care, might have been avoided.

In view of the changing character of road traffic and the legalised use of traction engines and heavy locomotives, it becomes increasingly difficult to determine what constitutes excessive weight or "extraordinary traffic" within the meaning of the Act of 1878.

Locomotive traffic in itself is not necessarily "extraordinary," and it becomes a matter of extreme difficulty to show that an increase in the cost of repairs to a particular length of road is due to the advent of a certain form of traction, and is not accounted for by any other cause. Again, the variation in the standard of traffic due to development of a district is a factor which renders so-called "extraordinary traffic" extremely elusive.

The various judgments given do not make for clearness. While in one case the "frequent and incessant use of a highway" is deemed to be extraordinary traffic, a learned judge in another case ignores the aggregate of the weight of traffic and reduces the question to a consideration of the conditions under which the weight is carried and the proportion in which it is distributed.

The certificate of the surveyor is necessary as a condition precedent to litigation. This should state that extraordinary expenses have been incurred by reason of damage caused by excessive weight or extraordinary traffic.

The schedule to the certificate should set forth the actual expenses of repair to the roads concerned, with a deduction of the average expenses of the repair to roads in the neighbourhood.

It is presumably within the discretion of the surveyor to make such allowances as he thinks equitable for ordinary expansion of the district and the resulting additional traffic.

The nett total in the schedule is the local authority's claim either upon legal proceedings being taken, or may be adopted as the basis for prior settlement by agreement.

One of the difficulties with which the surveyor has to contend is that he has not always a means of ascertaining when the damage is first commenced. The best course appears to be to take action in all cases as soon as practicable, and to submit the first certificate within such time after the damage is noticed as will enable legal proceedings to be begun before the expiry of twelve months from the date of the commencement of the damage.

The certificate should state the name of the party by or in consequence of whose order the extraordinary traffic has been caused. This, too, may be a difficult matter to determine. The local authority may proceed against the contractors, or even the haulage contractors, but it would appear to be most desirable to proceed against the principal person by whose orders the extraordinary traffic or excessive weight has been conducted.

The claim may be challenged or met, or if the damage is being caused by a particular contract or work extending over a protracted period, proceedings may be delayed to within six months after completion, by mutual consent, always provided that the responsible party furnishes satisfactory details as to the nature of the work in hand. This will avoid several cases being taken on the same matter, but the surveyor should submit half-yearly to his council bills, signed certificates and schedules which may be passed on by the council to the party responsible; and payments on account of the damage may be received during the time the work is in progress, subject to settlement on completion of the work or cessation of the damage.

It is important for the surveyor's certificate to be in time for proceedings to be commenced within six months after the cessation of the damage, and particular care must be taken to ascertain correctly the date on which the traffic causing damage actually ceased.

It may be that more than one party are causing extraordinary traffic to pass along the same roads, and it is necessary in such a case for the damage to be analysed and apportioned between the parties liable. This necessitates a careful record of the traffic being taken, of the reputed weight of all vehicles passing, the nature of the contents, and by whose orders the material is being conveyed. In the case of legal proceedings, such a return is necessary to show that the apportionment of the damage is just and reasonable.

There is one form of extraordinary traffic which is particularly rife at present, in consequence of the military occupation of certain districts. Every other cost incidental to the concentration of the Imperial Forces and the movements of troops to various centres is a charge upon the Imperial Exchequer, and it would appear to be invidious to charge the extra cost of maintenance to the ratepayers, who are already victimised merely because their district affords a convenient military centre. It would, however, be untimely, if not distasteful, to take any action in the present crisis.

With the enormous increase of extraordinary traffic during recent years, various suggestions have been made from time to time to facilitate the recovery of expenditure under this head. The remedy generally presumes the possibility of an agreement being entered into before the extraordinary traffic takes place, whereas in actual practice the existence of extraordinary traffic becomes evident only when damage to the roadway is an accomplished fact.

There is always a further difficulty in taking advantage of the proviso to sec. 23 of the 1878 Act, as it is necessary to assume the mode of conducting the traffic and the probable weather conditions in order to estimate the anticipated expenditure. In such a case, to do justice to the highway authority it is imperative that any agreement should be made subject to adjustment of the amount payable, in view of the probability of altered conditions arising. Generally a contractor will refuse to enter into such an agreement, and will rather take the risk of legal proceedings.

In view of the present impracticability of making roads sufficiently strong to withstand any kind of traffic, it is important that a concise record be kept of the expenditure, character and effects of traffic, weather conditions and other details, including the condition of the surface and sub-crust in respect of all roads. By this means it may be proved conclusively that the difference in cost of maintenance of the roads before and after the traffic in question comes upon them is a material amount, and that the extent of the repairs is reasonable. The method of collecting evidence and of keeping accounts is a matter of extreme importance, and it would be well if some standard form were adopted.

Until power is sanctioned by Parliament to define extraordinary traffic as to nature and quantity, there does not appear to be any possibility of providing any simpler or more effective way of protecting the ratepayer than by the present cumbersome procedure. In the meantime, every eventuality must be prepared for, and much useful work may be done, first, in so regulating heavy traffic that it shall not cause damage; and, secondly, if damage be caused, by being in a position to recover compensation in such cases.

If anything can be done by amendment of the law in regard to extraordinary traffic to facilitate the recovery of expense with which local authorities are saddled, and to render less difficult the task of those responsible for highway administration, it is desirable that the powers that be, and in particular this institution, should take the necessary steps without delay.

There exists the probability that traffic which today may be proved to be extraordinary traffic will become by usage and local conditions ordinary traffic; and it is the duty of a local authority (while protecting the ratepayer) to avoid the danger of employing the legal weapons available to the point of arresting development and progress of its district, and possibly of its industries.

DISCUSSION OF MR. KIRBY'S PAPER.

The Chairman (Mr. W. J. Steele) said that generally speaking, he was not at all in favour of interfering in the slightest degree with industry. Even if the traffic of a district did cost the local authority something, they ought not to put any obstacles in the way of the development of local manufactures. There were certain trades that had been harassed a little too much by local authorities—and certainly in that respect. He thought the law on the subject was this: That they could only charge a person for extraordinary traffic if he were doing something of a

temporary nature, but that if he were developing a colliery or mining they could not charge [illegible] extraordinary work. He thought that reasoning was very sound, for if there were no [illegible] there would be no authority and no people to maintain. Subject to there being no interference with industry he agreed there should be some alteration in the law by which a charge could be levied.

Mr. FRANK MASSEY (Wakefield) said he had had cases in which he had perhaps omitted the matter, and enabled them to come to amicable settlements. They had had others in which there had been faults on both sides, and cases which ought to have been settled, but which owing to a settlement not being arrived at, had involved loss to both parties. It was very uncertain, however much one claimed whether one would get what one was entitled to. Generally speaking, it was the usual practice for people to make claims high on the chance that they would get a certain proportion awarded them, and possibly costs—and the costs in that sort of thing should weigh very heavily in the case. He remembered one case in which they claimed £1,500. He would not say that they ought to have claimed that much but it cost them that much always what the average annual cost had been for five years. Mr. Kirby put it that it might be presumed that the road, after it was repaired, was going to be in a very much better state than before. On the other hand, it might be contended by the local authority that they did not want such a strong road, and that there was no necessity to have it strengthened. If, however, it was a road that was going to be more extensively used, he thought it was only fair that the authority should say: "We have now a better and stronger road that will serve us better in the future, and therefore there should be a reduction in the amount to be recovered." One always had the highest respect for the judges who sat to hear these cases, but whether a claim was going to be successful depended to some extent on the judge one came before. He remembered in one case before counsel had a chance of saying anything the judge asked: "Who are these people? What is their rateable value? Don't they pay rates and employ a large number of men? Are you not trying to hamper the trade of the district?" Finally, he said the action of the local authority was most iniquitous, and, of course, they lost. Counsel put their heads together, and they got compensation by consent for £200, the whole of which was swallowed up in costs. Before they had any idea of litigation they had invited the defendants to meet them and discuss on the ground what could be done for the restoration of the road. Counsel, however, did not bring out that point, otherwise the judge might not have said what he did. With the greatest respect for the bench, he thought the tribunal before which such matters came should be altered altogether. He thought a small tribunal composed of practical men not interested in the district at all—practical engineers or surveyors—would be able much better to come to a decision as to the amount of damage actually done. In the opening paragraph of his paper Mr. Kirby had said that, despite the change that had taken place in the methods of transport on highways, the percentage of self-propelled vehicles to the total volume of traffic was still comparatively small. He thought Mr. Wakeford would agree with him that their eyes were opened very much by a census they took at a recent date as to the traffic entering and leaving Wakefield; the weight of the traffic put a very different complexion on the matter. Of course, they agreed with Mr. Kirby that damage was very often done in wet weather just after a frost. Then as regarded the expense of repair, he had tried to point out on the one hand that it was not fair that the authority should have a much better road, but, on the other hand, that it was equally unfair that the amount of damage should be assessed on the average cost of the repair of the roads in the neighbourhood. He was quite in accord with the chairman as to not trying to stop industry, for, after all, the West Riding of Yorkshire lived on the industry created within its borders. Nor did he think it would be wise to push on to the military authorities any large expenditure on account of extraordinary traffic, for the shopkeepers were going to reap the benefit of the increased trade which the military occupation of a district brought.

Mr. W. J. HADFIELD (Sheffield) stated that in his city they had weights up to 100 tons on four wheels passing over their roads. In one thoroughfare they laid a tar-macadam centre along the road, and this withstood quite well weights such as he referred to. [illegible] ment by which they were enabled to make a charge. In Sheffield they kept a record of the cost of every street from the time traffic first went on to it, and if they could afford to do it he thought smaller authorities could do the same. Personally he should not care to make an application to a court without [illegible] been. He agreed, having regard to the trade that resulted, that it was best to say nothing as to the damage caused by military traffic.

Mr. H. P. FOSTER (Leeds) observed that, although in large manufacturing centres heavy traffic was not regarded as "extraordinary," it caused an extraordinarily large expenditure. On one road in Leeds, over which wagons drawn by traction engines passed between certain works, they had found, on taking up the tramway setts, that they had all crumbled to pieces, and were of no further use. They had now, [illegible] it was hoped that they would be able to carry that traffic along the tramway lines by making a junction with the works at each end. It was hoped that they would make a reasonable profit out of the traffic, while saving the works something in the cost of transport. They could deal with the traffic at roughly 4d. per ton-mile.

Mr. J. P. WAKEFORD (Wakefield) said he agreed with the remarks of the chairman as to the inadvisability of crippling the industry of a district. They had had a considerable amount of damage done to setts in their district, but the council, as a rule, did not take any great account of it.

Mr. W. FOWLDS (Keighley) spoke of the damage done to a little side road by a traction engine engaged in transporting a fair. The matter was taken up, but they got nothing out of the proprietors. He thought that was a case in which they ought to have been paid something.

Mr. L. ROSEVEARE (South Shields) said that in his town they had anything up to twenty horses drawing castings along the roads, and in spite of the damage caused by such traffic he would not advise his council to take any action, regarding the traffic as vital to the interests of the town, and one which they should encourage. From experiments which he had carried out he had found that by bedding setts in sand and jointing them with Plascom they did not get the crushing that occurred when the setts were bedded in sand and jointed with cement. He agreed that [illegible] own case he could say to one halfpenny what had been the expenditure on haulage, labour and materials on every road.

A vote of thanks was passed to the author of the paper.

Mr. KIRBY, in the course of his reply, said he quite agreed with the chairman as to the desirability of not interfering with industry. He thought that the law generally as to heavy traffic wanted widening and consolidating. One of the speakers had suggested a single arbitrator instead of a judge, but the difficulty was that the arbitrator would require to have seen the road before and after the damage was done. It was really not worth going to law, because one never got what one asked for. He took it that in adopting tar-macadam for heavy traffic the desire was to secure a resilient paving. As to traction engines versus tramways, the conveyance of material at 4d. per ton-mile seemed very cheap.

THE ORPHAN FUND.

Before the close of the proceedings the CHAIRMAN stated that recently, after examining the last balance-sheet of the institution Orphan Fund, he had drawn the attention of the hon. secretary of the fund to the fact that the income was very much greater than the expenditure. Mr. Rowson, in reply, had admitted that that was a fact on paper, but that there were a good many cases they would have liked to help but for the lack of funds; and another important point was that they were attempting to create a fund which, by the interest that would accumulate, would in time become permanent, and make it unnecessary to rely on the collections which were made at the different meetings.

A collection for the fund realised £1 10s. 9d.

The members were afterwards entertained to tea by the Mayor, to whom a cordial vote of thanks was passed for his hospitality.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

The premium for January is awarded to

Mr. E. W. PUGH,
Fernside, Handel-road,
The Polygon, Southampton.

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

454. Foundations. What should be the composition of concrete for the foundations of a factory chimney stack? Would lime concrete be suitable? (Ajax.)

455. Testing Materials.—Give an outline sketch of a testing machine for tension tests of steel. (Inquirer.)

456. Strength of Materials.—A rectangular beam is loaded by a weight at its centre. How will the deflection be changed by (*a*) doubling the span, (*b*) doubling the width, (*c*) doubling the depth, or (*d*) doubling the load?

457. Hydraulics. [illegible] Explain carefully the [illegible] be varied [illegible] on the right-hand side of the [illegible] and [illegible] the velocity of [illegible] have been determined.

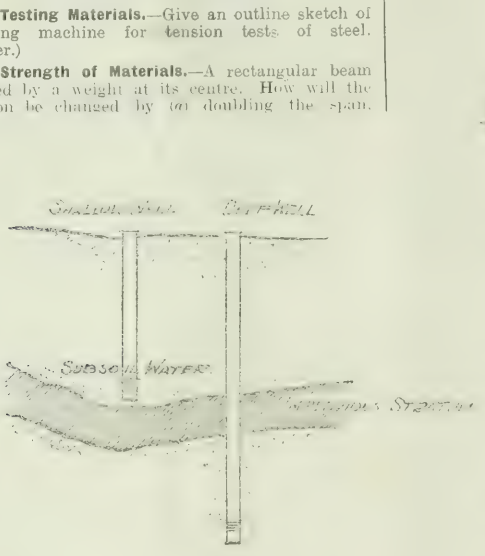
458. Fireproof Construction.—Give sketches of [illegible]

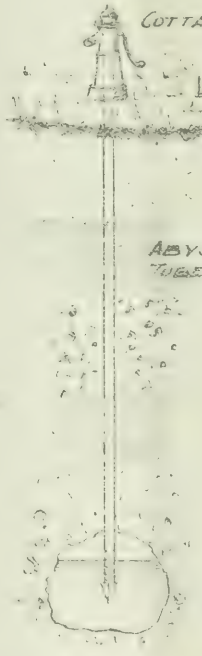
[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

452. Wells.—What are—(1) A deep well, (2) a shallow well, (3) an artesian well, and (4) an Abyssinian well? Give definitions. (G. C., *Wigston Magna.*)

Well [illegible] Deep wells [illegible] shallow wells. Deep wells are those which obtain their supply by tapping the water-bearing stratum beneath the impervious stratum, while shallow wells rely on subsoil water for their supply. Of course, shallow wells may be much deeper than some "deep" wells. Artesian wells are bored, whereas common wells are dug. The water in artesian wells, or borings, will rise approximately to the height of the point of supply, which may force the water above the ground level, thus reducing the amount of pumping required. Artesian wells derive their name from the province of Artois, in France, where they were first used. Abyssinian wells are "tube" wells, generally used for temporary supplies. They are formed by driving first a tube with a pointed end, and perforated holes near this point into the ground, and





[illegible]

453. Building Construction. Draw a section showing the construction of a flat asphalted roof, carried on timber joists 10 in. by 2½ in., resting below the wall to be of 14 in. brickwork, surmounted by a 9 in. parapet, 2 ft. high, coped with stones, the section to run across the joists and through the parapet walls. ("Ajax.")

The drawing on the opposite page is submitted in answer to this question.

Institution of Civil Engineers.—At a meeting to be [illegible] Mr. F. Dixon Evans, [illegible] will read a paper on "Municipal [illegible] Matters." The [illegible] will take place [illegible]

CORRESPONDENCE.

THE MANUFACTURE OF CONCRETE TUBES.

To the Editor of THE SURVEYOR.

SIR,—Referring to [illegible] on the 16th ult. of the paper on the Application of Concrete in Modern Sanitation read by Mr. Henry J. Tagg, A.M.I.C.E., Mr. Tagg stated in his paper that some years ago at the request of the Corporation of Leicester he carried out experiments with a view to ascertaining whether concrete tubes could be satisfactorily made in the moulds by the application of heat, and that as the result of these experiments he arrived at the conclusion that it was not advisable to do so. The president, Prof. Henry Adams, remarked that on several occasions he had heard Mr. Tagg's views on the matter, and at the time of the discussion we thought it would be well if, through the medium of your valuable paper, we could [illegible] tubes in the moulds by artificial heat. Some time ago we obtained the highest expert advice upon this subject, and the report entirely confirmed our own opinion—viz., that drying concrete tubes by artificial heat is destructive to the nature of the cement.—Yours, &c.,

JOHN ELLIS & SONS, LTD.

February 1, 1915.

SAFEGUARDS AGAINST ENTERIC.

To the Editor of THE SURVEYOR.

SIR,—In the introduction to "Municipal Engineering, 1914" [illegible] Special Article [illegible] January 29th [illegible] say that the comparative immunity from enteric of our little Army in France is due to the effective treatment of drinking water by modern plant. Should not this be qualified by a reference also to the wonderful efficacy of inoculation as a preventative?—Yours, &c.,

GERM MAN.

February 1, 1915.

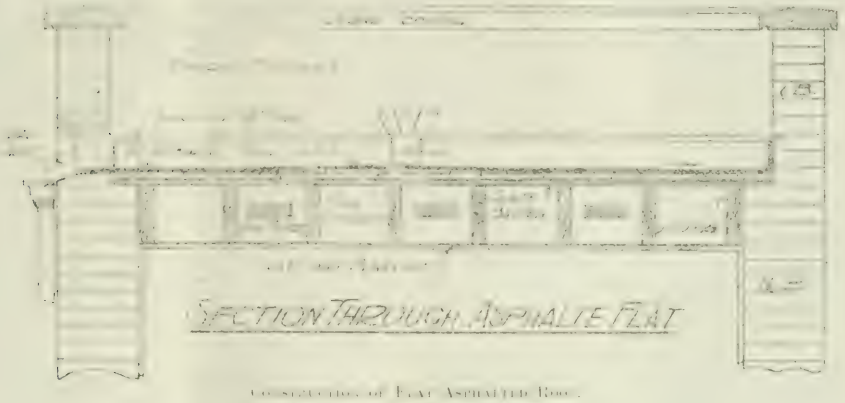
Worcester Sewage Works.—The Worcester City Council on Tuesday, acting on the Water and Sewerage Committee a letter received from the Local Government Board stating, in regard to the sewage disposal works, that the reports received from the experts consulted showed clearly that the works were not being used in the manner for which they were designed and as accepted by the board; and further that the method in use was not one which could be expected to produce satisfactory results. The board were of opinion that the sewage should be properly treated in tanks before it was passed to the filters, and that the tank liquor should be properly distributed over the surface and allowed to flow downwards through the filters. The board reminded the council that by a resolution of August 1st the latter pledged themselves to carry out such works as would be satisfactory to the board. In the circumstances the board called upon the council to carry out the undertaking in their resolution without delay.

STEWARTS AND LLOYDS, LIMITED.

[illegible] Stewarts & Lloyds, Limited, issued the following circular to their customers:—

"Certain misconceptions appear to have arisen in [illegible] the nature and [illegible] German interests in the Clydeside Tube Company, Limited, which is controlled and managed by Stewarts & Lloyds, Limited. In order to correct any [illegible] we desire to put the following facts before you.

"The Wittener Stahlrohren Werke Gesellschaft [illegible] have been for [illegible] years makers of seamless steel tubes for a number of years according to various patents and processes, the property of that company and of Mr. Heinrich Stuting, their engineer, and have [illegible] and a large [illegible] in the United Kingdom. With this fact before us in 1911 [illegible] that we should [illegible] that [illegible] with the [illegible] in this country.



CONSTRUCTION OF FLAT ASPHALTED ROOF.
(See Advertisement Section, page [illegible].)

"Having regard to the experience acquired by the Wittener Company and Mr. Stuting, both in the construction of the special plant required and in the processes of manufacture, we considered it advisable that the arrangements to be made should be such that the experience of the Wittener Company and of Mr. Stuting would be secured in the practical development of the new venture. This could not have been done by a payment in cash, and accordingly, instead of trying to purchase outright the patents and processes and Mr. Stuting's experience and services, we formed the Clydeside Tube Company, Limited, with a capital of £175,000, divided into 175,000 shares, of which Stewarts & Lloyds and their nominees hold one half, and the German company, Mr. Stuting and nominees the other half, and the [illegible] £62,500 [illegible] paid to the German [illegible] on account of their holding.

"Notwithstanding the equal division of shares, the Articles of Association secure to Stewarts & Lloyds the perpetual control and management of the company by provisions as to voting at directors' and shareholders' meetings and as to general management. Needless to say, all the information required with regard to this company under 'The Trading with the Enemy (Amendment) Act, 1914' [illegible] market to the Custodian [illegible] Stewarts & Lloyds [illegible] on his appointment, and apart from [illegible] add that shortly after the outbreak of war we informed the Imperial authorities fully as to the whole position. So far as Stewarts & Lloyds are concerned we may state that with over 4,000 shareholders there is only one [illegible] German nationality, and his holding is £600."

Tar-painting in Norfolk.—Owing to a clerical error—which did not arise in this office—it was stated on p. 174 of our Special Annual Issue that 780 miles of roads in the county of Norfolk are to be tar-painted during the next financial year. The figure should have been 120.

The Urban Land Problem as it Affects Town Planning.*

By Professor S. D. ADSHEAD, F.R.I.B.A.

Few problems connected with town planning are more complex than those concerned with the acquisition and utilisation of urban areas. At the outset we are beset with a tangle of legal issues which, controlling as they do all progress in urban development, must be dealt with. All who hold public appointments realise the difficulty of acquiring land in urban areas for public purposes, and although our legislation is being continually amended, as yet it is admittedly inadequate, and procedure under Act of Parliament to compulsory acquirement is still in favour of the private owner; and it is generally conceded that procedure by private treaty is, when possible, very much cheaper.

Improvements seem to point to greater powers being given to local authorities, and even registered societies, for acquiring land without reference either to Parliament or a Government Department. Local authorities need powers similar to those enjoyed by the Metropolitan borough councils under the Michael Angelo Taylor Act. But the crux of the question lies not so much in powers of acquirement as in the basis of compensation.

Under the Finance Act land is to be valued by reference to recent sales where they occur and separately as to site and building. This is good, but the lack of any instruction for arriving at the proportions of the value to be attributed to each is entirely lacking. The most difficult of the issues arising out of the valuation of properties are certainly those connected with its potentiality and expectancy, and here we are at once confronted with that elusive factor increment duty.

VALUATION.

It always appears to me that notwithstanding the importance of its recognition, our valuers, depending too much on traditional practice and custom, take too narrow a view of its range of influence and origin. We easily realise that to primitive man land would vary in value in the ratio of its location and natural resources, and that outside these inherent assets other interests are humanly created; and it appears to me that the lack of a clear understanding of the difference between land undeveloped and developed, between its inherent and acquired interests, between its natural and artificial assets, is at the root of all bungling in property valuation. As a town planner with broad views as to property valuation I make these suggestions:—

In assessing the value of a property in an urban area, site and building should be valued separately. An overall price might be arrived at by a recent sale, the average nett rental during a period of three years, or the rateable value amended if out of date, and twenty-five years' purchase or more according to conditions of permanency. I would divide this between site and building. I would settle the site value in accordance with the decision of a judicial commission which should sit and settle site values by the test of taking typical parts of streets, or areas of a town periodically, but in periods not exceeding twenty years. The difference between these periodic values would represent increment, and I would credit the particular property in question with a potential value only if it could be shown that the [illegible] exceeded the average of other properties in that part of the street or town. If less use than the average, [illegible]

As to what amount of freedom should be given to local authorities in the compulsory acquisition of property for public purposes, I would for safety's sake like to see a Government Department consulted on all occasions. But my recollection of the procedure of certain local Government Boards [illegible] makes me shudder to think of the application of that principle in its entirety. The safety ensured to the individual by compulsory reference to a higher [illegible] compensated for by the time and expense necessary to make that authority acquainted with the conditions of the case. I would have the Michael Angelo Taylor Act in some sort of form extended to every local authority with power to [illegible]

* Extracts from paper read at the last meeting of the Town Planning Institute.

recent or the amount at stake comparatively small. Further, I would [illegible] as held in his able symposium on the municipal purchase of land, empower municipalities to obtain land in advance without necessarily being obliged to state the specified purpose for which each acre should be used.

I have now, I think, dwelt at sufficient length upon the acquisition of urban land. We will now proceed to discuss more closely its utilisation.

UTILISATION OF URBAN LAND.

I hope that the time is not far distant when the powers contained in the Town Planning Act with reference to the ultimate disposal of undeveloped lands will be extended to built-up areas with regard to their future rebuilding. The extraordinary changes, both in the use and value of properties that have already overtaken and are still overtaking urban areas due to the newer means of communication, are as yet but partially appreciated, and but little understood. We ought certainly to have a Town Planning Act with reference to built-up urban areas. Borough councils should hold powers of control over the reconstruction of properties lying in the route of prospective streets, and ought also to have control over the class and character of new buildings to be erected in any particular part of a town. There would, of course, be compensation to pay where the prevention of development was incurred in view of the construction of a new street; but I think it is right and proper that compensation should not be admitted in respect of the prevention of a class of property that would prove detrimental to the best interests of the locality in which it was proposed to be erected.

I think that the time will very shortly arrive when it will be realised that the wholesale demolition of worn-out areas and huge schemes for rebuilding will be found to be more profitable than the present system of hopeless preservation and patching, and this will be found to be more particularly the case in regard to residential property.

Assuming that large areas of worn-out residential property could be acquired reasonably in urban areas, both in [illegible] and condemned not only by public authorities, but also by societies—the question that would at once confront us would be, What sort of scheme for rebuilding would meet with modern requirements as regards convenience and appearance, and at the same time provide a good financial return? I venture to affirm that, while some areas would be better converted into commercial districts, the majority ought again to be rebuilt as residential. I am not one of those who consider that the urban housing question is one entirely of the transference of the occupants of all old residential areas in closely built-up portions of a city to garden suburbs. In my opinion, there will always be a huge population who, with or without a garden, will prefer to live in the town.

In [illegible] ing, our inquiry at once brings us up against the [illegible] the block building of three stories and more or the cottage. In the past the strongest arguments in support of the tall tenement building have been the high price of land, and the need for housing large numbers of people in limited areas, due, in a measure, to the legal necessity of rehousing the whole of the dispossessed within the limits of the reconstructed area. With regard to the first reason—the high price of land—I think it has often been found necessary to erect tall buildings in order to distribute big ground rents over numerous tenements; but at the same time it is questionable whether the extra capital expended upon thick walls, additional staircases, &c., does not outbalance the extra percentage in rents.

BY-LAWS.

So far I have refrained from referring to the by-laws, but before dealing with actual building, which I now propose doing, I must direct your attention to one [illegible] seriously amending. By-laws having reference to the laying out of new streets where the Town Planning Act is not in operation are outside the pale of reasonable discussion. With their inelastic condition of width and construction, their martial insistence on

The Surveyor
And Municipal and County Engineer.

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regularly spaced cross-streets, and their extraordinary opposition to the construction of the picturesque types of residential street known they are actually unsympathetic to all the interests of residential property in towns. Then, as to heights of rooms and proportions of window-space, that these should have no relation to density of building is an anomaly.

By-laws appear to me to be at their best in objecting to matters of construction, thickness of walls, &c.; perhaps they are most insane when they deal with questions of light and air. When will we get rid of that awful 15-in. wall creeping over our roofs like giant snails?

THE LOCAL GOVERNMENT BOARD MEMORANDUM.

It now remains for me to dwell for a moment upon the several possible types of urban residential buildings, and in this connection let me refer you to the Local Government Board's Memorandum of March 25, 1913, which relates to the provision and arrangement of houses for the working classes. In my opinion, this Memorandum is an exceedingly well-drafted document. It is, however, not beyond criticism. Perhaps it is at fault in not making a marked distinction between urban and rural housing. The conditions are very different. Of the five model types for which plans are given, A, B, C and D can be built either in rows or separately. Type E is necessarily semi-detached. While type D is of the parlour pattern, types A, B and C have only the living-room and scullery. It is obvious that the parlour, described by Mr. Burns as the mausoleum, is not in favour with the Local Government Board. Without its provision, however, there is always a danger that the occupants will live in the scullery and consecrate the kitchen.

Time will not permit of my referring to all the debatable questions that arise out of this Memorandum. I shall briefly refer to two others—the back passage and the number per acre. With regard to the former, my experience at Liverpool, where they have a 9-ft. back passage, and at Kennington, where they don't have any at all, convinces me that the latter is by far the best arrangement. The back passage is the resort of all sorts of undesirable men and animals, and suggests all sorts of nasty things. The main reason in support of it—convenience for dust removal—is illusory. In this class of property there is no objection whatever to the little refuse of the day being collected before 10 a.m. at the front door.

With regard to the number per acre, the Memorandum points out that the annual charges in respect of a loan for land spread over a maximum period of eighty years would in most cases constitute a comparatively small proportion of the total annual cost of providing [illegible] houses on the basis of [illegible] to the acre on land at £1,000 per acre [illegible] per house for land per acre would be [illegible] per house. This, of course, is applicable to rural areas, but where land, as at Liverpool, has to be purchased at a cost often exceeding £4,000 per acre, ten to the acre means giving the £4,000 away. While ten to the acre is impossible, if not undesirable, in urban areas, I think a limit of twenty-five or thirty might reasonably be laid down. Even then a price exceeding £1,000 an acre makes difficult building.

The Memorandum states that it is undesirable to erect big rows of houses without a break, and it is stated that this arrangement is monotonous and depressing in appearance. My reply is that it all depends upon how it is done. Long rows of cottages without a break in towns like St. Albans do not strike me as monotonous. It is the repetition of the standard type which becomes monotonous. However, I have really very little fault to find with the Memorandum of the Local Government Board. I consider it a most progressive document, and would particularly commend to the notice of all authorities about to lay out streets for residential purposes part 5, paragraph (*d*), which relates to the desirability of introducing economy and variety in the construction and arrangement of residential streets and approaches.

MUNICIPAL ENGINEERS AS ARCHITECTS.

Finally, one word as to who is to be responsible for the design [illegible] cottages which local authorities are authorised and encouraged to erect. The Local Government Board and all Acts of Parliament studiously avoid any reference as to how this is to be done. The Memorandum states that it will be well to bear in mind that houses erected by a local authority ought generally to be such as will be a model or standard for houses for the working classes which may be erected by private persons. The assumption appears to be that local authorities have only to say the word and the thing is done. As a matter of fact, but few local authorities can afford to permanently keep in their employ officials specially qualified to do the work, and are tempted to entrust such work to their already overworked surveyor and engineer.

The work of the municipal engineer is closely connected with that of the architect in so far as they are both concerned with the mixing of concrete and the erection of a brick wall, but the partnership separates here. For the rest the engineer's ability to erect cottages is the ability of the untrained practitioner added to the experience of the observant amateur. In these days of town planning there is plenty of work for the engineer and surveyor. Their peculiar training and experience enables them to bring to bear in the initial stages of the town plan a considered judgment which is theirs alone, but the architect, by training and experience, is alone qualified to build cottages and advise on the laying out of the separate acres which are grouped together by the engineer and surveyor in his broader view of the [illegible] plan.

Manchester's Third Pipe from Thirlmere.—Alderman Holt, chairman of the Waterworks Committee of the Manchester Corporation, announced to the city council on Wednesday that the third pipe from Thirlmere to Manchester is now completed and in use. The city is now drawing 30,000,000 gallons of water day by day from the Lake Thirlmere.

London Ground Plan.—At a cost of more than £20,000, the great ground plan of London, begun by the County Council exactly twenty years ago, has been completed. It is divided into two sections. The ownership section shows the names of the owners and agents of the freeholds; the detailed section gives the changes that have occurred in the twenty years. The ownership section was completed four years ago, with the exception of 1½ square miles, in respect of which difficulty was experienced in ascertaining the particulars of ownership. It has taken four years to get these particulars. Estates covering 115 square miles, with 36,000 owners, are shown in the plan. The map was originally estimated to cost £16,650, but this sum had been spent four years ago. In addition to this map, a 6-in. map of London showing building operations from year to year is prepared by the council's valuer at a cost of something like £100 a year.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible*

INQUIRIES HELD.

Bingley T.C. (January 28th. Mr. R. H. Bicknell) £267 toward the expense of improving the corner at Keighley Road on the Bradford-Keighley road near Cullingworth. The improvement was authorised by the Bingley Tramway Order of 1913, and must be carried out before the Bingley tramways can be carried beyond the corner on the Bradford route. The total cost of the improvement is estimated at £800, and most of the remaining expenditure will be borne by the West Riding County Council.

Ilkley U.D.C. (January 28th. Mr. W. O. E. Meade-King.)—£800 supplemental expenditure in connection with the erection of the Winter Gardens adjoining the King's Hall. The original estimate of the cost was £3,000, £1,000 of which was for public conveniences. The Local Government Board sanctioned the borrowing of £3,000, but the purchase of more land and enlargement of the building has now necessitated the further sum of £2,800 being required.

Lytham U.D.C. (January 21st. Mr. R. C. Maxwell.) This was an inquiry into an application for the issue of a Provisional Order under the Public Health Act, 1875, to alter the Lytham Improvements Acts so as to grant powers to the council to construct a marine lake and open-air baths on the foreshore, and to acquire the baths and assembly rooms and site for the purposes of a new public hall. It was stated that the lord of the manor had consented to sell the baths and assembly rooms on advantageous terms for the purposes of a new hall, the price being £750, and the ground rent for the 17·20 sq. yds. 1s. 3½d. per yard. The council had also taken 25 acres of the foreshore, from Charlie's Mast to Woodville-street, and it was intended to construct a hall which would be surrounded by a boating lake, like that at Southport. There would be other attractions a paddling pool, and an open-air theatre for entertainments.

Shillelagh U.D.C. (January 29th. Mr. F. E. Sparrow). £2,486 for the completion of the erection of cottages in the district.—The inspector intimated that he would recommend the Local Government Board to sanction the loan, there being no opposition.

APPLICATIONS FOR LOANS.

Audley U.D.C. £1,500 for the purposes of the gas works and mains and £500 for automatic lighters.

Chester T.C. £765 for works of sewerage and £3,012 for tarking up streets.

Croydon T.C. £53 for an underground w.c. at Norbiton.

Edmonton U.D.C.—£1,514 for road improvement.

Holme Cultram U.D.C. £326 further loan for sea defence works.

Larne U.D.C. £15,000 for a sewerage scheme.

Linthwaite U.D.C. £20,100 for paving the main roads.

Louth R.D.C. £300 for works of drainage.

Lymm U.D.C. £300 for works of sewerage.

Malton R.D.C. £320 for works of water supply.

Sealby U.D.C.—£605 for road improvements.

Southgate U.D.C. £1,800 for the erection of a public convenience.

Staines R.D.C. £1,007 for road widening and re-surfacing.

Stoke-on-Trent T.C.—£3,066 for road improvement, and £1,62[illegible] for laying out a park.

Tadcaster R.D.C. £9,000 for works of water supply.

Wallsend T.C. £3,470 for hospital extension.

Walthamstow U.D.C.—£2,000 for the purchase of land for a housing scheme, and £300 for road widening.

LOANS SANCTIONED.

Barnoldswick U.D.C.—£1,500 for an additional lift for the gasholder.

Beckenham U.D.C.—£3,715 for road improvement and silvering.

Bilston U.D.C.—£13,773 for road strengthening and improvement.

Bowland R.D.C.—£2,180 for sewerage works.

Broadstairs U.D.C. £2,650 for the erection of a town depot.

East Ham T.C.—£7,387 for additional tanks and contact bed at the sewage disposal works.

Enfield U.D.C.—£2,810 for keeper's lodges and public conveniences in the public parks.

Finchley U.D.C. £325 for a public swimming bath and £750 for water filtration plant.

Foleshill R.D.C. £11,250 for the provision of workmen's houses.

Hendon U.D.C. £11,120 for sanitary purposes. Duties paving and kerbing and £9,092 for wood paving.

Holme Cultram U.D.C.—£1,224 for sea defence works.

Lurgan U.D.C.—£1,200, supplemental loan for the erection of cottages.

Luton R.D.C. £1,150 for a sewerage scheme.

Rawmarsh U.D.C. £2,000 for a scheme of sanitary improvement.

Rotherham U.D.C.—£2,000 for sewerage works in the South Ward.

Withernsea U.D.C.—£2,720 for road works, and £400 for sewerage works.

Worcester T.C. £450 for the provision of public conveniences.

FORTHCOMING INQUIRIES.

FEBRUARY.	£
8.—**Loughborough.** For the provision of a fire brigade station and depot (Mr. R. H. Bicknell)	5,806
9.—**Abertillery.** For the erection of working-class houses (Mr. Courtenay Clifton)	32,657
9.—**Birmingham.** For works of sewerage (Mr. F. H. Tulloch)	8,560
9.—**Gillingham.** For the provision of a depot and cabling (Mr. Edgar Dudley)	175
9.—**Holmfirth.** For the purposes of a cattle market (Mr. R. H. Bicknell)	320
9.—**Manchester.** For works of sewerage (Mr. P. M. Crosthwaite)	61,775
9.—**Newton Abbot.** For works of water supply (Mr. W. O. E. Meade-King) ...	3,100
10.—**Bristol.** For the provision of a women's lodging house (Mr. Courtenay Clifton)	2,000
10.—**Oldham.** For the purposes of a recreation ground (Mr. F. H. Tulloch) ...	3,710
11.—**Failsworth.** For works of street improvement (Mr. F. H. Tulloch)	1,197
11.—**Northallerton.** For the purposes of water supply (Mr. P. M. Crosthwaite)	
11.—**Okehampton.** For works of sewerage and water supply (Mr. W. O. E. Meade-King)	240
11.—**Southwell.** For the purposes of water supply (Mr. W. M. Gross)	500
12.—**Frome.** For works of water supply (Mr. W. O. E. Meade-King)	1,700
12.—**Hexham.** For the purposes of water supply (Mr. P. M. Crosthwaite)	1,000
13.—**Harrogate.** For the [illegible] (Mr. F. H. Tulloch)	545

Garden City for Government Workers.—Following [illegible] Woolwich Borough Council to the Local Government Board drawing attention to the dearth of housing accommodation at Woolwich, owing to the influx of workmen at the Arsenal, the Government have purchased 90 acres of land between Woolwich and Eltham, and the estate is to be laid out as a garden city for Government workmen. The plans provide for blocks of four and six houses [illegible] to the road by gates 200 ft. deep, leaving ample garden space.' About 1,000 houses are to be built, and a portion of the estate is to be preserved as an open space.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making this feature as complete and accurate as possible.*

The following are among the more important projected works on which particular appeal is lacking: Bath Rural D.C. housing and beach protection; Aberystwyth Corporation sheet, refuse disposal; Bridlington road and materials; Cork Corporation, Glyncorrwg Local Sanitary Authority, Stirling Corporation, sewerage and sewage disposal; Portobello, Rochdale, sewerage and electricity; Arnold U.D.C., Nottingham, Pontefract and other projected works will be found in our Local Government Board Inquiries page.

BUILDINGS.

Bath T.C.—An estimate of £7,150 has been passed for slope protection at the Bathing Establishment.

Bridlington T.C.—The council are considering a proposal to erect [illegible] for the Electricity Department.

Exeter T.C.—The city surveyor, Mr. J. Maddock, has received instructions to prepare plans for [illegible] fronting Bonhay-road and Queen-street.

Glyncorrwg U.D.C.—The surveyor, Mr. W. P. [illegible], has received instructions to obtain tenders for the purchase of land at the rear of the Council Offices, Caerau.

Huddersfield T.C.—The Highways Committee has requested the Parliamentary Committee to apply for powers in the next Parliamentary Bill to provide for the erection of all back-to-back houses within the borough.

Leyton U.D.C.—It is proposed to provide a public convenience at the corner of Church-road and Lea Bridge-road, at a cost, including the purchase of the land, of £2,110.

Lincoln T.C.—Having provided open-air bathing north, south and west of the city, the corporation are now considering the best means of providing for the provision of a bathing station on the banks of the river Witham on the town side of Pyewipe Inclosure. It is announced that they were now in a position to obtain a [illegible] of attaining their object at a cost of about £100. Baths would be provided at low Stamp End Lock, and people living on the south side of the city would be conveyed to the corporation workmen.

Loughborough T.C.—The council on Tuesday approved the expenditure of £300 on land, [illegible] purchase and [illegible] in connection with the housing undertaking.

Luton T.C.—Amended plans have been prepared for the extension of the infectious diseases hospital.

North Riding C.C.—The council have accepted the contributions of the Road Board [illegible] and Guisborough Urban and Rural District Councils (£100) towards the cost of rebuilding Dunsdale bridge and improving the approaches thereto.

Nuneaton T.C.—A tender, at £583, has been accepted for the erection of a mortuary.

Rochdale T.C.—The Tramway Committee recommend the provision of an additional car shed and workshop at an estimated cost of £11,000.

HOUSING AND TOWN PLANNING.

Aberystwyth T.C.—The council have under consideration an extensive scheme for the provision of working-class dwellings.

Cleator Moor U.D.C.—The Housing Committee have adopted a housing scheme estimated to cost £7,000.

Evesham R.D.C.—It was reported that the council's housing scheme had been completed at £15 or £20 below the estimated cost, after £100 had been spent on extras. The surveyor, Mr. E. Holloway, stated that, as far as he could see, there would be a saving on all the schemes.

Market Bosworth R.D.C.—A scheme has been approved for the erection of twenty-five workmen's houses.

Wednesbury T.C.—Plans have been approved for twenty-four artisans' dwellings. Each house will have 287 sq. yd. of ground, either paved or as garden, while on the opposite side of a new intended road is a large mound with an area of 19,481 sq. yds. The slope of this has been planted with trees, so that the aspect will be an exceptionally pleasant one.

PARKS AND OPEN SPACES.

Hereford T.C.—[illegible] the Ecclesiastical Commissioners and the Bishop of Hereford [illegible] the purchase of a large [illegible] proposed to be laid out as an open space.

REFUSE COLLECTION AND DISPOSAL.

Bridlington T.C.—A [illegible] has been passed to [illegible] the Council's best [illegible] is at present charged 10s. 2½d. per load.

Dover T.C.—A committee has been formed to consider the desirability of the council undertaking the work of refuse disposal.

ROADS AND MATERIALS.

Armagh R.D.C.—The county council have forwarded [illegible] approving the new scheme for the maintenance of the [illegible] No. 2 rural district by a system of direct labour, under the charge of the county surveyor. It is provided, however, that the foremen and surface men under the scheme shall be appointed by the [illegible] Council.

Barking U.D.C.—[illegible] Mr. D. L. Jackson, Parliamentary [illegible] has been appointed to the borough of Coppetts.

Brierley Hill U.D.C.—The council have agreed to the proposal of the surveyor, Mr. J. L. Harpur, that application should be made to the Road Board for [illegible] the improvement of a number of roads.

Chelmsford T.C.—The borough surveyor, Mr. P. T. Harrison, has received instructions to prepare plans for making up Swiss-avenue.

Cork T.C.—A letter has been received from the Road Board stating that they were prepared to give favourable consideration to an application by the council for the grant of £1,000, previously indicated to be allocated to works of road improvement, estimated to cost £5,000.

Derbyshire C.C.—The council have approved the scheme of the county surveyor, Mr. J. W. Horton, for the diversion of the main road at Allestree, at an estimated cost of £[illegible].

Durham C.C.—The council have agreed to the proposals of the Works Committee to pave the carriageway of Elvet Bridge, Durham, at an estimated cost of £578, and the completion of the Darlington-Durham section of the Great North road, at an estimated cost of £12,000, application [illegible] Road Board for a grant of half the cost of the first-mentioned improvement, and a grant [illegible] towards the cost of the North road work. With reference to the proposed improvement of the Hart roads, it was reported that the estimate had been revised to £13,058, towards which the Road Board had conditionally agreed to contribute £9,200, and the Hartlepool Rural District Council £2,800, on the understanding that the county council would take over the roads as main roads. The Road Board have agreed to contribute half the estimated cost (£5,100) of the improvement of Crossgate-path, Durham, provided the Durham Corporation [illegible] £1,000, in lieu of [illegible] the land necessary for the work.

East Grinstead U.D.C.—The council have conditionally approved the plan of the surveyor, Mr. W. E. Woolton, for a proposed widening in the Lewes-road, at an estimated cost of £350, subject to the county council contributing a reasonable proportion of the expense.

Glyncorrwg U.D.C.—It has been resolved to carry out works of street improvement at an estimated cost of £10,000.

Holywell R.D.C.—The council have rescinded a resolution passed last July to contribute not more than £50 a year towards the cost of the proposed new road from Gronant to Rhyl.

Kildare C.C.—Approval has been given to a scheme for the construction of a new road in Ballyna and [illegible] the Edenderry No. 2 rural district.

COUNTY OF SOUTHAMPTON.

COUNTY SURVEYOR'S DEPARTMENT.

Applications are invited for the following temporary appointments:

FOR EDUCATION WORK.

(1) QUANTITY SURVEYOR.—Salary at the rate of £200 per annum.

(2) ARCHITECTURAL DRAUGHTSMAN.—Salary at the rate of £182 per annum.

(3) ARCHITECTURAL DRAUGHTSMAN.—Salary at the rate of £172 per annum.

(4) ARCHITECTURAL DRAUGHTSMAN.—Salary at the rate of £156 per annum.

FOR OTHER ARCHITECTURAL WORK, ROADS AND BRIDGES.

(5) ENGINEERING ASSISTANT.—Salary at the rate of £156 per annum.

(6) QUANTITY SURVEYOR AND ACCOUNTANT.—Salary at the rate of £130 per annum.

(7) JUNIOR ACCOUNTANT CLERK.—Salary at the rate of £104 per annum.

Applicants should state their age, whether married or single, and give information as to their training and experience.

No application will be considered from an unmarried man eligible for service in the Army.

Applications, accompanied by copies of recent testimonials, should be sent to W. J. Taylor, County Surveyor, The Castle, Winchester, on or before 15th February, 1915. (2,335)

COUNTY BOROUGH OF BELFAST.

WORKS DEPARTMENT.

TENDERS FOR STORES, WORK, AND UNIFORM CLOTHING.

The Works Committee are prepared to receive Tenders for the supply of the following Stores, Work, and Uniform Clothing for a year commencing on 1st April, 1915:—

Earthenware Sewer Pipes.
Timber.
Slates.
Hardwood.
Iron Castings.
Plumbers' Work.
Nails, &c.
Iron and Steel.
Paints, Oils, &c.
Glazing.
Mill Furnishings.
Shovels, Spades, Grapes and Buckets.
Scavenging Brushes.
Glazed Bricks.
Artificial Flags.
Lime.
Pitch, Felt, Tar, &c.
Sea Sand, Sea Gravel, and Lough Neagh Sand.
Cement.
Uniform Clothing and Hats.

Forms of Tender and Particulars may be obtained from Mr. Hector F. Gullan, M.Inst.C.E., Superintendent of Works, City Hall.

Sealed Tenders, on Official Form only, endorsed "Tender for ——," to be lodged in my office before 12 o'clock noon on 16th February, 1915.

The lowest or any Tender will not necessarily be accepted.

A Tender, if sent by post, must be registered; if delivered by hand, an official receipt must be obtained for it; otherwise the undersigned will not be responsible.

R. MEYER,
(2,337) Town Clerk.

HAMPTON URBAN DISTRICT COUNCIL.

SUPPLY OF MATERIALS, &c.

The above Council hereby invite Tenders for the supply of:—

(1) Hand-broken Granite.
(2) Granite Chippings.
(3) Broken Kentish Brown Flints.
(4) Derbyshire Limestone Metalling Material.
(5) Forage.
(6) House Coal and Coke.
(7) Besoms and best Stable Yard Brooms.

Forms of Tender, Conditions and all Particulars may be obtained at the Offices of the Council, Hampton, Middlesex, where Tenders must be delivered, sealed and endorsed "Tender for ——," not later than 4 p.m. on Thursday, the 25th day of February, 1915.

Dated this 30th day of January, 1915.

By order,
SIDNEY H. CHAMBERS,
Surveyor to the Council.

Public Offices,
Hampton, Middlesex. (2,334)

CITY OF WESTMINSTER.

The Westminster City Council invite Tenders from persons willing to Contract for the Execution of the undermentioned Works and the Supply of the undermentioned Materials, Articles, &c., for three months, six months, or twelve months, commencing on the 1st April next:—

1. Ballast and Sand.
3. Boots, &c. (New and Repairs).
4. Bricks.
5. Brooms and Brushes.
6. Carriageway and Footway Repairs (Asphalt).
7. Carriageway Repairs (Macadam).
8. Carriageway Repairs (Granite Sett Pavement).
9. Carriageway Repairs (Wood Pavement).
10. Cement and Lime.
11. Christchurch-yard Garden Maintenance.
13. Disinfectants.
14. Drysaltery, Soaps and Sundries.
15. Dust Basket (New and Repairs).
16. Flags (Sandstone and Artificial).
17. Footway and Channel (Masons' Work).
18. Gas and Hot-water Fittings.
19. Granite (Broken).
20. Granite Setts, Kerbs and Channels.
21. Gullies (Stoneware) Construction.
22. Harness (New and Repairs).
23. Hats, Caps, &c.
25. Horse Hire and Cartage Work.
26. Hose Pipe (New and Repairs) Leather.
27. Iron Castings.
28. Petroleum Spirit.
29. Plumbers' Materials and Miscellaneous Oils.
30. Pitch and Creosote Oil.
31. Plate Sheet Belts, &c., Tree Guards and Sundries.
32. Refuse Wagons Repairing Springs, &c.
33. Rubber and Waterproof Goods.
34. Sewerage and Drainage (Main Works).
35. Shovels Picks Sewer Implements and Edge Tools.
36. Stencil Paper Ink, &c., for Duplicating Machines.
37. Stoneware Goods.
38. Street Name Plates (supply and Fixing).
39. Tarpaulin.
40. Tar-spraying Macadam Roads.
41. Timber.
42. Tool Handles.
43. Towels.
45. Wood-paving Blocks (three months Contract only).
46. Washing Towels.

Specifications and Forms of Tender may be obtained on and after the 8th February instant on application at the City Hall between ten a.m. and four p.m. (Saturdays ten a.m. and twelve noon). Each Tender, on the official Form supplied, is to be delivered at the City Hall in a sealed cover, addressed to the Town Clerk, and marked with the name of the Tender. Tenders may be placed by or on behalf of Tenderers in a locked box at the City Hall provided for the purpose. No Tender will be received after 9.30 a.m. on Thursday, the 18th February, 1915.

The Contractors will be bound by the Contract, in the case of all persons employed to whom the pay, wages at rates not less and to observe hours of labour not greater, than the rates and hours recognised by the Associations of Employers and Employees, and in practice obtained in the district where the work is to be executed.

Tenderers are prohibited from directly or indirectly canvassing Members or Officials of the Council in reference to any Tender, and the Tender of any person who does so canvass will be rejected. The Council do not bind themselves to accept the lowest or any Tender.

JOHN HUNT,
Town Clerk.

Westminster City Hall,
Charing Cross-road,
London, W.C.
February 3, 1915. (2,336)

GRADUATE, 27, desires Assistantship in office of Municipal or County Engineer and Surveyor; experience M.T. Roads, Concrete, Garage-road. Rhyl. (2,338)

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. S. PICKERING, M.INST.C.E., Borough Surveyor and Water Engineer, Cheltenham.

MEETING IN METROPOLITAN DISTRICT.

A meeting of the institution will be held at 92 Victoria-street, Westminster, on Friday [illegible].

PROGRAMME.

8 p.m.—Presentation to the late secretary, Mr. T. Cole.

8.15 p.m.—Paper by Mr. H. D. Searles-Wood, F.R.I.B.A., on "Building By-laws and a Court of Appeal" (which will be taken as read).

Discussion.

Adjourned discussion on paper by Mr. W. H. A. Court, on "By-laws and the Housing Question," presented at the meeting at Hinckley on October 3, 1914.

NORMAN SCORGIE, M.INST.C.E.,
Hon. District Secretary.

Hackney.

J. W. DUDLEY ROBINSON,
Secretary.

92 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. W. H. MATTHEWS, City Engineer and Surveyor, Chester.

ANNUAL MEETING AND DINNER (NORTHERN DIVISION).

The annual meeting of the Northern Division will be held at the Town Hall, Newcastle-on-Tyne, at 2.30 p.m. on Saturday, February 13th, for the transaction of general business. The meeting will be followed by the annual dinner, to be held at the Royal Turk's Head Hotel, Grey-street, at 6 for 6.30 p.m. [illegible]

As the president of the institution, Mr. Matthews-[illegible] is expected to be present at the annual dinner, it is earnestly desired that every member of the Northern Division will make a special effort to be in attendance, together with any member of his [illegible] staff who may be eligible to accompany his guest.

LEON ROBERTS,
Hon. District Secretary.

[illegible] Offices,
Darlington.
February 10, 1915.

COUNCIL MEETING.

At a meeting of the council held on Thursday, January 28th, the following applications were recommended for admission:—

To Membership: Messrs. J. C. Phillips, chief electrical engineer, Leederville Municipality, W. Australia; R. F. Braithwaite, surveyor, Selby Rural District Council; A. P. Horsley, borough engineer and surveyor, Hartlepool; and A. M. King, engineer, Cobar Municipality, N.S.W.

To Associate-membership: Mr. E. Rogers, surveyor, Bampton Urban District Council.

Finance and General Purposes Committee.—It was decided that Messrs. A. R. Bleazard and W. Wallin, as representing the North-Western and Northern Districts, should be added to these committees.

By-laws.—The General Purposes Committee was requested to consider the revision of by-laws, especially as to the provision in No. 16 for the recording upon the ballot paper of the attendances at meetings in the case of members seeking election to the council.

By-law No. 10.—The case of a certain member was referred under this by-law to his district committee, and another case was referred to the General Purposes Committee for report to the council.

B. WYAND,
Secretary.

39 Victoria-street, S.W.

The next meeting of the council will be held in London on Friday, February 26th.

ROYAL SANITARY INSTITUTE.

MANCHESTER MEETING.

A meeting of the Royal Sanitary Institute to be held at Manchester on Friday, February 19th, a discussion on "The Construction of Sewers," which will be illustrated by lantern slides, will be opened by Mr. S. S. Platt, M.INST.C.E., borough engineer of Rochdale, and on "Housing from the Sanitary Inspector's Standpoint," by Mr. H. Dryland, of the Manchester Sanitary Department.

The chair will be taken at 7 p.m. by Sir Henry Tanner, C.B., I.S.O., F.R.I.B.A.

[illegible] the Sanitary Committee of the corporation, Alderman Frowde, has kindly consented to arrange for the members to inspect an interesting section of the Manchester main drainage scheme.

Electric Omnibuses for West Bromwich.—[illegible] West Bromwich Higher Tramways Committee [illegible] report [illegible] that [illegible] the Old Chester and Uppull's Corner being superseded by the Way [illegible] that have [illegible] the question of [illegible] their place and [illegible] [illegible] [illegible]

TEMPORARY ASSISTANT. — February 12th.—Chorley Corporation. £2.—Town Clerk.

ROAD FOREMAN.—February 16th.—Corporation of Hertford. 35s. 40s. per week. Mr Alfred Baker, town clerk.

COUNTY SURVEYOR.—February 27th. County Council of Notts. £750 per annum and travelling expenses.—Mr. H. Hampton Copnall, clerk, Shire Hall, Nottingham.

ASSISTANT ENGINEERS. — April 1st. — Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

LIVERPOOL.—February 8th.—Designs for workmen's dwellings for about 500 persons. Premiums, £100, £50, and £25.—The Town Clerk.

CLUTTON.—February 23rd.—Schemes for providing a public water supply, for the parishes of Chelwood, Chew Magna, Chew Stoke, Norton, Malreward, Publow, and Stanton Drew, for the rural district council. Premiums of £100 and £50 will be awarded to the first and second best competitors.—Mr. J. Sumner Dury, clerk, Temple Cloud, Bristol.

WALTHAMSTOW.—Plans for the erection of workmen's dwellings at an estimated cost of £16,000, for the urban district council.—Mr. C. S. Watson, clerk, Town Hall.

BRADFORD.—Designs for the re-planning of streets in the central area of the city, for the corporation. Mr. Reginald Blomfield, R.A., has been nominated assessor.—Mr. F. Stevens, town clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

BROADSTAIRS.—February 8th.—For the construction of buildings, fencing, and weighbridge, for the rural district council.—Mr. H. Hurd, Council Offices.

DENBIGHSHIRE.—February 8th.—For the erection of the first section of a school, for the Education Authority.—Mr. W. D. Wiles, High-street, Wrexham.

PORTSMOUTH.—February 8th.—For additions to a school, for the Education Committee.—Mr. A. H. Bone, surveyor, Cambridge Junction, Portsmouth.

PENZANCE.—February 8th.—For the erection of workmen's dwellings, for the corporation.—Messrs. Cowell & Drewitt, architects, Lennard's Chambers, Penzance.

ILFORD. — February 9th.—For the erection of lavatory accommodation at the town hall, for the urban district council.—Mr. H. Shaw, engineer and surveyor, Town Hall.

WORCESTER.—February 9th.—For the construction of new filter tanks, brook conduit, sand store, mains and other works at the waterworks, for the corporation.—Mr. T. Caink, city engineer, Guildhall, Worcester.

CREWE.—February 10th.—For the erection of a pavilion, for the corporation.—Mr. G. Eaton Steele, borough surveyor.

COVENTRY.—February 10th.—For the erection of workmen's dwellings, for the Housing Committee.—Mr. J. E. Swindlehurst, city engineer.

TEWKESBURY.—February 10th.—For the erection of six cottages, for the rural district council.—Messrs. Prothero, Phillott & Barnard, 31 Promenade, Cheltenham.

HAMPSHIRE.—February 10th.—For the erection of a pair of cottages, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

COVENTRY.—February 10th.—For the extension of a school, for the Education Committee.—Messrs. G. & I. Steane, 22 Little Park-street, Coventry.

LITTLEHAMPTON. — February 10th. — For the erection of an isolation hospital, and also public lavatories, for the urban district council.—Mr. H. Howard, surveyor.

LAMBETH.—February 11th.—For the repair and renewal of the iron and lead gutters, and also for the repair of the lanterns to the stable roof of the depot buildings, for the borough council.—Mr. H. Edwards, borough engineer, Town Hall, Brixton-hill, S.W.

COVENTRY.—February 12th.—For the erection of a pavilion, for the corporation.—Mr. J. E. Swindlehurst, city engineer.

GLASGOW.—February 12th.—For the erection of waiting-rooms and model yacht house, for the corporation.—Mr. J. Whitton, superintendent of parks, 249 George-street, Glasgow.

CROYDON.—February 12th.—For the extension of buildings at the waterworks, for the corporation.—Borough Engineer.

SOUTHEND.—February 12th.—For the erection of an electricity station, for the corporation.—Mr. J. Elford, borough engineer.

MILFORD.—February 13th.—For the erection of twenty-seven cottages, for the rural district council.—Mr. S. Watters, clerk, Council Offices, Milford, Ireland.

HALIFAX.—February 13th.—For laying pipes and enlarging pump well, for the corporation.—Mr. J. Lord, borough engineer.

RADCLIFFE.—February 13th.—For the erection of sixteen houses, for the urban district council.—Mr. W. L. Rothwell, engineer and surveyor.

BATLEY.—February 13th.—For the erection of a building for purification plant at the public baths, for the corporation.—Mr. J. H. Craik, town clerk.

CARDIFF.—February 15th.—For the erection of a filter-house, for the corporation.—Mr. C. H. Priestley, waterworks engineer, City Hall.

SHEFFIELD.—February 15th.—For the erection of bowling-green pavilions in timber and brick with slate roofs, for the corporation.—Mr. F. Wike, city engineer, Town Hall.

TREDEGAR.—March 15th.—For the erection of a caretaker's lodge, for the urban district council.—Mr. W. Lloyd Roach, surveyor.

SHEFFIELD.—February 15th.—For the erection of a bowling-green pavilion, for the corporation.—Mr. C. F. Wike, city engineer.

MONMOUTH.—February 15th.—For the erection of a school, for the Education Committee.—Mr. J. Bain, County Offices, Newport.

HIRWAIN.—February 15th.—For the erection of a school, for the Joint Schools Committee.—Mr. T. Botting, Education Offices, Aberdare.

WARRINGTON.—February 16th.—For additions to the sanatorium, for the corporation.—Borough Surveyor.

LOCHGOILHEAD.—February 16th.—For the erection of three double cottages, for the town council.—Mr. J. Whitton, superintendent of parks, 249 George-street, Glasgow.

MONMOUTH.—February 16th.—For alterations and additions to a police station, for the Standing Joint Committee.—Mr. W. Tanner, county surveyor, Monmouth.

TRURO.—February 16th.—For the erection of four cottages, for the rural district council.—Mr. C. Hancock, 12 Princess-street, Truro.

TORONTO.—February 16th.—For the construction of a refuse incinerating plant, for the Board of Control, Street Commissioners, Department of Street Cleaning, Toronto.

AYR.—February 17th—24th.—For the erection of a hospital and additions to administrative buildings, for the corporation.—Mr. J. Young, burgh surveyor.

BEESTON.—February 17th.—For the erection of a pumping station, destructor, and messroom, for the urban district council.—Mr. W. H. Radford, engineer, Albion Chambers, King-street, Nottingham.

LEEDS.—February 17th.—For the erection of a school, for the Education Committee.—Mr. J. Graham, Education Offices, Calverley-street, Leeds.

LINDSEY.—February 15th.—For [illegible] to the Education Committee. [illegible] Education Architect's Office, Hall, Wakefield.

RHONDDA.—February 29th.—For the [illegible] a secondary school for the urban district council. [illegible] J. Rees, architect, Hillside Cottage, Pontypridd.

WEST RIDING.—February 12th.—For the [illegible] classrooms at the Hemsworth Knottingley schools for the Education Committee. Education Architect's Office, Hall, Wakefield.

SOMERSET.—February 29th.—For the erection of [illegible] Wells.

ST. HELENS.—For the [illegible] for the [illegible] Bradley, borough engineer.

MENAI.—For the [illegible] street, Menai Bridge.

STOCKPORT.—March 1st.—For the erection of a refuse destructor, for the corporation. Mr. J. Atkinson, borough surveyor.

BOMBAY.—March 7th.—For the erection and equipment of a refuse destructor, for the Municipal Commissioner. Messrs. Henry [illegible] Co., 65 Cornhill, London, E.C.

SOUTHALL-NORWOOD.—For the [illegible] Mr. Reginald Belcher, engineer and surveyor, Town Hall, Southall.

Iron and Steel.

EALSHAM.—For the [illegible] Mr. Wilkes, [illegible] Bridgefoot.

FIVERTON.—For [illegible] Mr. [illegible] borough surveyor.

Roads.

PLOMESGATE.—February 8th.—For the supply of broken granite and flint, for the rural district council. Mr. D. R. Read, Clerk, Board Room, Woodbridge Market, Suffolk.

BEVERLEY.—February 9th.—For the supply of stone for macadamising, for the rural district council. Mr. E. Parker, surveyor.

BIRKENHEAD.—February 8th.—For the supply of granite, Rowley rag, basalt and chert, Penmaenmawr breaking stone, natural flags, paving setts, and creosoted red deal paving blocks, for the corporation. —Mr. C. Brownridge, borough engineer and surveyor.

HERTS.—February 8th.—For the supply of broken granite, for the county council. Mr. H. S. Killick, county surveyor, County Surveyor's Office, Hatfield.

WALTHAM.—February 8th.—For the supply of granite, flints, gravel, hoggin, ballast, sand, tar-macadam, and [illegible] council.—Mr. W. C. Holloway, engineer and surveyor, Town Hall, Waltham Abbey.

BOWNESS.—For the supply of granite and slag, for the rural district council.—Mr. W. Shepherd, surveyor.

CLEETHORPES.—February 8th.—For the supply of road materials, for the urban district council. Mr. C. H. Wardman, surveyor.

EXETER.—February 8th.—For road widening and street works, for the corporation. Mr. J. Moulding, city engineer and surveyor.

CHADDERTON.—February 8th.—For the supply of rubble stone and slag tar-macadam, for the urban district council. The Surveyor.

LONDON.—February 9th.—For paving works, for the London County Council.—Chief Engineer, County Hall, Spring-gardens, S.W.

EASINGWOLD.—February 10th.—For the supply of whinstone and slag, for the rural district council. Mr. F. J. H. Robinson, clerk.

LEEDS.—February 10th.—For flagging and tar-macadamising certain streets, for the corporation Highways Department, 155 Kirkstall-road, Leeds.

BRADFORD.—February 10th.—For the cartage of road material and team labour, for the corporation. —Mr. W. H. S. Dawson, city engineer and surveyor.

CANTERBURY.—February 10th.—For the supply of [illegible] Turley, city surveyor.

WELLINGTON.—February 10th.—For the supply of broken whinstone, granite, limestone, slag, and tar-[illegible] Kilner, highways surveyor.

GRAYS THURROCK.—February 10th.—For the supply of [illegible] granite chippings, for the urban district council. The Surveyor, [illegible] Grays.

[illegible] February 10th.—For the supply of granite and granite chippings, for the rural district council.—Mr. H. W. Coupe, clerk.

[illegible] February 10th.—For the supply of granite, tarred granite, gravel and hoggin, for the [illegible] and surveyor.

LANARK.—February 12th.—For the supply of tar [illegible] Whyte, district clerk, Hamilton.

[illegible] February 12th.—For the supply of broken granite, basalt, quartzite, limestone, and tar-[illegible] Offices, Dorchester.

KEYNSHAM.—February 12th.—For the supply of granite or basalt, limestone, and tarred macadam, also for the supply on hire of two or more steam rollers and scarifiers, for the rural district council.—Mr. J. Johnson, surveyor.

[illegible] H. S. Maples, clerk.

[illegible] street, for the urban district council.—Mr. Edwin Gill, [illegible] and surveyor.

HEADINGTON.—February 12th.—For the supply of granite and granite chippings, for the rural district council. Mr. A. Walker, district surveyor, Windmill Hill.

CARDIFF.—February 13th.—For works of street improvement, for the corporation. City Engineer.

HAILSHAM.—February 13th.—For the supply of road materials and cartage, for the rural district council. —Mr. E. Catt, clerk, 17 London-road, Hailsham.

[illegible] February 14th.—For the supply of road materials, for the corporation.—Mr. T. S. Picton, borough surveyor.

SURBITON.—February 15th.—For the supply of road materials, for the urban district council.—The Surveyor.

SWANSEA.—February 15th.—For the supply of road materials, tar, sand, and haulage, for the rural district council.—Mr. G. R. Thomas, highway surveyor, Forestfach.

LOUTH.—February 15th.—For the supply of granite and slag, for the rural district council.—Mr. F. C. Chard, clerk.

THIRSK.—February 15th.—For the supply of whinstone, limestone, slag and tar, for the rural district council.—Mr. C. A. Lake, highway surveyor.

MARGATE.—February 15th.—For the supply of unbroken pit flints and broken pit flints, for the corporation.—Mr. E. A. Borg, borough surveyor.

LEYLAND.—February 15th.—For the supply of broken granite, slag, tar-macadam, limestone dust, kerbs, setts, rubble, and concrete and natural flags, for the urban district council.—Mr. M. H. Wilkinson, surveyor, Leyland, Lancs.

LONG SUTTON.—February 16th.—For the supply of granite, slag, slag screenings, and Holt hoggin, for the urban district council.—Mr. S. S. Mossop, clerk.

EAST SUFFOLK.—February 17th.—For steam rolling during the year ending March 31, 1916, for the county council. Mr. W. Jervis, county road surveyor, County Hall, Ipswich.

FLAXTON.—February 17th.—For the supply of whinstone, broken annealed slag, and common slag, for the rural district council.—Mr. J. Peters, clerk, 4 New-street, York.

SHARDLOW.—February 17th.—For the supply of slag tar-macadam, Leicester granite, ironstone slag, and limestone, for the rural district council.—Mr. [illegible] surveyor, Aston-on-Trent, Derby.

ROTHERHAM. February 17th.—For the supply of granite and slag, for the rural district council. Mr. R. Bradbury, district surveyor, Imperial Buildings, Rotherham.

SHREWSBURY.—February 17th. For the supply of broken macadam, tarred granite macadam, tarred slag, broken slag, tar-spraying, distilled tar, crossing blocks, Yorkshire or Lancashire kerbs, flags, and channels, and concrete flags, for the corporation. Mr. A. Ward, borough surveyor, The Square, Shrewsbury.

NEWMARKET.—February 18th.—For the supply of best broken Leicestershire granite and tarviated granite chippings, for the urban district council.—Mr. W. H. Eley, surveyor.

SETTERING. February 18th. For the supply of granite, slag and tar-macadam, for the rural district council.—Mr. J. H. Porter, surveyor.

WISBECH. February 18th. For the supply of granite, ironstone slag, gravel and rag-stone, for the rural district council.—Mr. A. Catling, surveyor, 4 Post Office-lane, Wisbech.

WORCESTER. February 18th. For the supply of tools, for the county council.—Mr. C. F. Gettings, county surveyor, 30 Foregate, Worcester.

CLAYPOLE.—February 18th.—For the supply of about 2,000 tons of granite, 1,500 tons of slag, and 150 tons of footpath gravel, for the rural district council.—Mr. A. J. Franks, clerk, Union Offices, 24 Lombard-street, Newark.

EAST SUFFOLK.—February 19th.—For the supply of road materials, for the county council.—Mr. W. Jervis, county road surveyor, County Hall, Ipswich.

CHESHIRE.—February 20th.—For the supply of refined tar, Tarvia, or Tarco, for the county council.—Mr. W. Holland, county surveyor, The Castle, Chester.

TANGIER.—February 20th.—For works of road construction and improvement, for the Special Committee of Public Works. — Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

SWINTON.—February 20th.—For the supply of granite setts, macadam, grit setts, flags, kerbs, and flag stone chippings, for the urban district council.—Mr. H. Entwistle, Council Offices.

SIBSEY.—February 20th.—For the supply of granite, slag, and slag rejections, for the rural district council.—Mr. J. M. Simpson, clerk, 28 Wide Bargate, Boston.

BEDS.—February 20th.—For the supply of broken granite, slag, flints, and gravel, for the county council.—County Surveyor, Shire Hall, Bedford.

CHESHIRE.—February 20th.—For the supply of macadam, tar-macadam, and chippings, for the county council.—Mr. W. Holland, county surveyor, The Castle, Chester.

MARPLE.—February 22nd.—For the supply of granite macadam and chippings, Macclesfield macadam and chippings, limestone macadam and chippings, 6-in. setts, and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor, Council Offices, Marple.

LITTLE HULTON.—February 22nd.—For the supply of broken granite, granite setts, granite, limestone and slag chippings, grit kerbs, and steam road rolling, for the urban district council.—Mr. J. H. Heyes, clerk.

HIGHWORTH. February 22nd.—For the repair of roads and hauling materials, for the rural district council.—Mr. O. Kimber, surveyor, Kite Hill, Wanborough, Wilts.

EPSOM.—February 22nd.—For the supply of road materials, for the rural district council.—Mr. T. E. Ware, surveyor.

SOUTHALL-NORWOOD.—February 23rd.—For the supply of 3,000 tons of tarred slag macadam, and repairing road surface, for the urban district council.—Mr. Reginald Brown, engineer and surveyor.

SURREY.—February 23rd.—For the supply of steam rollers and water carts, for the county council.—Mr. A. Dryland, county surveyor, County Hall, Kingston-upon-Thames.

MUTFORD.—February 24th.—For making up two roads, for the rural district council. The Surveyor.

RICHMOND.—February 24th.—For making up certain roads, for the corporation.—Mr. J. H. Brierley, borough surveyor.

SHEPTON MALLET. February 25th. For road maintenance and the supply of materials, for the rural district council.—Mr. J. Neish, surveyor.

BRIDGNORTH.—February 25th.—For the supply of granite, basalt, and slag, for the rural district council.—The Surveyor, Oldbury, Bridgnorth.

Sanitary.

COTTINGHAM.—February 8th.—For reconstructing brick outfall sewer and manholes, for the urban district council.—Mr. J. H. Hanson, surveyor.

ALNWICK.—February 8th.—For supplying and laying earthenware pipes, for the rural district council.—Mr. F. Wade, Embleton.

LEEDS.—February 8th.—For the supply of cement, earthenware drain pipes, sewer ironwork, galvanised dirt boxes, and sewer ventilating columns, for the corporation.—Mr. W. T. Lancashire, city engineer, Municipal Buildings.

BLAYDON. February 9th.—For scavenging work, for the urban district council.—Mr. R. Biggins, Council Offices.

ORSETT.—February 10th.—For the construction of a sewer, manholes, and disposal works, for the rural district council.—Mr. J. Beck, clerk, 2 Orsett-road, Grays.

HOUGHTON-LE-SPRING.—February 10th.—For work of scavenging, for the rural district council.—Mr. W. Morley, sanitary inspector, Sunderland-street.

PENYBONT.—February 12th.—For scavenging work in certain parishes, for the rural district council.—Mr. E. W. Davies, sanitary inspector, Bryn-road, Tondu.

WIRRAL.—February 12th.—For the construction of stoneware pipe sewers and other works, for the rural district council.—Mr. W. W. Shennan, 9 Hamilton-square, Birkenhead.

RADCLIFFE—BURY.—February 13th.—For the extension of the sewerage systems, for the Radcliffe Urban District Council and the Bury Rural District Council.—Mr. W. L. Rothwell, engineer, Radcliffe.

HAMBLEDON.—February 13th.—For the removal of refuse, for the rural district council.—Mr. F. Smallpeice, clerk, 138 High-street, Guildford.

MANCHESTER.—February 13th—27th.—For sewage disposal works extension, for the Rivers Department.—The Secretary, Rivers Department, Town Hall.

BLEAN.—February 15th.—For the construction of stoneware pipe sewers, manholes, and other works, for the rural district council.—Mr. F. A. Ward, engineer, Rosencath, Eddington.

KEYNSHAM.—February 15th.—For the construction of sewers and manholes, for the rural district council.—Mr. H. M. Bennett, surveyor, 36 Corn-street, Bristol.

LANCHESTER.—February 15th.—For scavenging No. 2 district, for the rural district council.—Mr. J. R. Lupton, surveyor.

THIRSK.—February 15th.—For the removal of house refuse, for the rural district council.—Mr. A. Green, Holmefield-terrace, Sowerby.

CROYDON.—February 15th.—For the supply of 4,000 tons of clinker filling for the new percolating filters at South Norwood farm, for the corporation.—Borough Engineer.

EAST GRINSTEAD.—February 17th.—For the construction of storm-water drains, for the rural district council.—Mr. C. Turton, surveyor.

LANCASTER.—February 18th.—For emptying cesspools, for the rural district council.—Mr. Littlefair, sanitary inspector, 5 Dalton-square, Lancaster.

CHERITON.—February 22nd.—For the removal of house refuse, for the urban district council.—Mr. A. Atkinson, acting clerk.

WOKING.—February 22nd.—For the construction of three screening chambers and detritus tanks, three sedimentation tanks, fifteen circular bacteria beds, provided with automatic distributors, six humus tanks, various lengths of effluent carriers, engine-house, sludge pump and press-house, and engine-houses for driving screens and pumping humus, and other works, for the urban district council.—Mr. G. Midgley Taylor, Caxton House, Westminster, S.W.

Stores.

CLEETHORPES.—February 8th.—For the supply of chalk, granite, concrete flags, bottoming macadam, topping macadam, straight York kerb, straight York channel, granite radius kerb, granite radius channel, ordinary pipes, new gullies, standard pipes, and ordinary pipes, for the urban district council.—Mr. C. H. Waithman, Council House, Cleethorpes.

WOOLWICH.—February 13th.—For the supply of ballast, sand, broom [illegible], drain pipes, forage, granite kerb, harness, ironmongery, road material, sewer ironwork, and timber, for the borough council.—Mr. J. Rush Dixon, borough [illegible], Town Hall, Woolwich.

RICHMOND.—[illegible] supply of uniform clothing, ironfounders' work, tools, ironmongery, bass brooms, brushes, granite, granite siftings, broken chalk, brown pit flints, crushed shells, granite kerb, channel, setts, York kerb, flagging, Portland cement, grey lime, artificial stone paving, harness, stable requisites, tar, tarred macadam, wood blocks, oils and paints, for the corporation.—Mr. J. H. Brierley, borough surveyor.

HALIFAX.—February 13th.—For the supply of paving setts, flags, kerb, granite, limestone chippings, lime, Portland cement, gravel, sand, earthenware pipes, granite paving setts, artificial flags, horse provender, coal, castings (manhole covers, gullies, and name plates), wrought iron, shovels, picks, ironmongery, oils, paints, candles, gunpowder, cotton waste, gaskin, brooms, brushes, timber, precipitants for sewage, filter cloths for sludge pressing, and team labour, for the corporation.—Mr. James Lord, borough engineer.

ECCLES.—February 15th.—For the supply of setts, flags, kerbs, broken rubble, broken slag, granite macadam and chippings, prepared tar slag, prepared tar limestone, limestone cube chippings, gravel, cinders, castings, pitch, creosote, tar, Simpson's patent street gullies, stoneware passage gullies, stoneware pipes, bends and junctions, mortar, and channel stones, for the corporation.—Mr. Thomas S. Picton, borough surveyor, Eccles.

SURBITON.—February 15th.—For the supply of team labour, broken Guernsey granite, concrete paving flags, general stores, repairing burst and damaged water pipes, cast-iron goods, tools, smiths' work, Derbyshire limestone, tar-paving materials, house refuse removal, Norway granite kerbing, Norway granite paving setts, Kent flints, gravel, Thames ballast, scavenging, slag tarred macadam, scavengers' brooms, horse sweeping brooms, machine brooms, lubricating oils, and sludge press cloth, for the urban district council.—The Surveyor, Council Offices, Ewell-road, Surbiton.

RAWTENSTALL.—[illegible] of road metal, earthenware pipes, gullies, timber, pitch, creosote oil, disinfectants, Portland cement, iron castings, local stone, workmen's tools, scavenging brushes, horse-shoeing, coal and coke, for the corporation.—Borough Surveyor.

STOKE-ON-TRENT.—February 20th.—For the supply of Portland cement, blue paving bricks, common bricks, sanitary pipes, gullies, macadam, chippings, pitch, creosote oil, cast ironwork, picks, shovels, general ironware, paints, oils, brooms, brushes, bath towels, dusters, ironmongery, general stores and disinfectants, for the corporation.—Borough Surveyor.

MANSFIELD.—February 22nd.—[illegible] granite, slag, tar-macadam, natural flags, kerbing, channelling, concrete flags, Portland cement, stoneware pipes, junctions, bends, timber, sewer ironwork, castings, coal, ironmongery, general stores, paints, oils, varnish, brooms, brushes, disinfectants, and harness, for the corporation.—Mr. Thos. P. Collinge, borough engineer and surveyor.

SOUTHALL-NORWOOD.—February 23rd.—For the supply of granite, lime, cement, oil, alumino-ferric, waste, press cloth, disinfectants, tools, picks, shafts, dust-bins, Kentish pit flint, hoggin, gravel, horse hire, steam rolling and scarifying, forage, coal, and coke, for the urban district council.—Mr. Reginald Brown, engineer and surveyor, Town Hall, Southall.

SOUTHEND-ON-SEA.—February 24th.—For the supply of stoneware pipes, bends, flints, bricks, gravel, sand, timber, ironmongery, paints, oils, colours, cement, lime, chalk, team labour, forage, tar-paving, tar-macadam, iron castings, granite kerb, channel, broken Guernsey granite, broken granite, pitch, creosote oil, harness supplies, sundries, brooms, brushes, steel, iron, and disinfectants, for the corporation.—Mr. Ernest J. Elford, borough engineer.

SOUTH SHIELDS.—February 27th.—For the supply of Northumberland whinstone, Fifeshire whinstone, Aberdeen and Norwegian granite, slag, granite chippings, Caithness flags, Portland cement, cement-concrete flags, cast ironwork, shovels, scavengers' brooms, machine brooms, coal, coke, disinfectants, leather hose, sewer boots, jackets, sanitary pipes, paints, paint oils, glass, timber, iron, horseshoe nails, cart axles, springs, tar, pitch, oils, and general stores, for the corporation.—Mr. Leslie Roseveare, borough engineer and surveyor.

MARYLEBONE.—March 1st.—For the supply of road materials, horses, harness and drivers, Portland cement, oils, stoneware sewers, ironwork for sewers, and slopping, for the borough council.—Mr. J. Paget Waddington, borough surveyor.

EPSOM.—March 9th.—For the supply of sewerage ironwork, gully gratings, shovels, picks, brooms, forks, dust skeps, disinfectants, Portland cement, stoneware pipes and gullies, kerbing and channelling, setts, broken granite, chippings and limestone dust, tar-paving and tar-macadam, coal and coke, hay, corn, bran, straw, bricks, paraffin, artificial stone paving, Thames ballast, Thames sand, veterinary surgeon's services, tar, pitch, and team labour, for the urban district council.—Mr. Edward R. Capon, surveyor, Bromley Hurst, Church-street, Epsom.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the [illegible] SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance. ‡ Provisionally accepted.

[illegible]

[illegible]

[illegible]

ROTHERHAM. February 17th.—For the supply of granite and slag, for the rural district council. Mr. R. Bradbury, district surveyor, Imperial Buildings, Rotherham.

SHREWSBURY.—February 17th.—For the supply of broken macadam, tarred granite macadam, tarred slag, broken slag, tar spraying, distilled tar, crossing blocks, Yorkshire or Lancashire kerbs, flags, and channels, and concrete flags, for the corporation.—Mr. A. Ward, borough surveyor, The Square, Shrewsbury.

NEWMARKET.—February 18th.—For the supply of best broken Leicestershire granite and tarviated granite chippings, for the urban district council.—Mr. W. H. Eley, surveyor.

KETTERING.—February 18th.—For the supply of granite, slag and tar-macadam, for the rural district council.—Mr. J. H. Porter, surveyor.

WISBECH.—February 18th.—For the supply of granite, ironstone slag, gravel and ragstone, for the rural district council.—Mr. A. Catling, surveyor, 4 Post Office lane, Wisbech.

WORCESTER.—February 18th.—For the supply of tools, for the county council.—Mr. C. F. Gettings, county surveyor, 30 Foregate, Worcester.

CLAYPOLE.—February 18th.—For the supply of about 2,050 tons of granite, 1,500 tons of slag, and 150 tons of footpath gravel, for the rural district council.—Mr. A. J. Franks, clerk, Union Offices, 24 Lombard-street, Newark.

EAST SUFFOLK.—February 19th.—For the supply of road materials, for the county council.—Mr. W. Jervis, county road surveyor, County Hall, Ipswich.

CHESHIRE.—February 20th.—For the supply of refined tar, Tarvia, or Tarco, for the county council.—Mr. W. Holland, county surveyor, The Castle, Chester.

TANGIER.—February 20th.—For works of road construction and improvement, for the Special Committee of Public Works.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

SWINTON.—February 20th.—For the supply of granite setts, macadam, grit setts, flags, kerbs, and flag stone chippings, for the urban district council.—Mr. H. Entwistle, Council Offices.

SIBSEY.—February 20th.—For the supply of granite, slag, and slag rejections, for the rural district council.—Mr. J. M. Simpson, clerk, 28 Wide Bargate, Boston.

BEDS.—February 20th.—For the supply of broken granite, slag, flints, and gravel, for the county council.—County Surveyor, Shire Hall, Bedford.

CHESHIRE.—February 20th.—For the supply of macadam, tar-macadam, and chippings, for the county council.—Mr. W. Holland, county surveyor, The Castle, Chester.

MARPLE.—February 22nd.—For the supply of granite macadam and chippings, Macclesfield macadam and chippings, limestone macadam and chippings, 6-in. setts, and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor, Council Offices, Marple.

LITTLE HULTON.—February 22nd.—For the supply of broken granite, granite setts, granite, limestone and slag chippings, grit kerbs, and steam road rolling, for the urban district council.—Mr. J. H. Heyes, clerk.

HIGHWORTH.—February 22nd.—For the repair of roads and hauling materials, for the rural district council.—Mr. O. Kimber, surveyor, Kite Hill, Wanborough, Wilts.

EPSOM.—February 22nd.—For the supply of road materials, for the rural district council.—Mr. T. E. Ware, surveyor.

SOUTHALL-NORWOOD.—February 23rd.—For the supply of 3,000 tons of tarred slag macadam, and repairing road surface, for the urban district council.—Mr. Reginald Brown, engineer and surveyor.

SURREY.—February 23rd.—For the supply of steam rollers and water carts, for the county council.—Mr. A. Dryland, county surveyor, County Hall, Kingston-upon-Thames.

MUTFORD.—February 24th.—For making up two roads, for the rural district council. The Surveyor.

RICHMOND.—February 24th.—For making up certain roads, for the corporation.—Mr. J. H. Brierley, borough surveyor.

SHEPTON MALLET.—February 25th.—For road maintenance and the supply of materials, for the rural district council.—Mr. J. Neish, surveyor.

BRIDGNORTH.—February 25th.—For the supply of granite, basalt, and slag, for the rural district council.—The Surveyor, Oldbury, Bridgnorth.

Sanitary.

COTTINGHAM.—February 8th.—For reconstructing brick outfall sewer and manholes, for the urban district council.—Mr. J. H. Hanson, surveyor.

ALNWICK.—February 8th.—For supplying and laying earthenware pipes, for the rural district council.—Mr. F. Wade, Embleton.

LEEDS.—February 8th.—For the supply of cement, earthenware drain pipes, sewer ironwork, galvanised dirt boxes, and sewer ventilating columns, for the corporation.—Mr. W. T. Lancashire, city engineer, Municipal Buildings.

BLAYDON.—February 9th.—For scavenging work, for the urban district council.—Mr. R. Biggins, Council Offices.

ORSETT.—February 10th.—For the construction of a sewer, manholes, and disposal works, for the rural district council.—Mr. J. Beck, clerk, 2 Orsett-road, Grays.

HOUGHTON-LE-SPRING.—February 10th.—For work of scavenging, for the rural district council.—Mr. W. Morley, sanitary inspector, Sunderland-street.

PENYBONT.—February 12th.—For scavenging work in certain parishes, for the rural district council.—Mr. E. W. Davies, sanitary inspector, Bryn-road, Tondu.

WIRRAL.—February 12th.—For the construction of stoneware pipe sewers and other works, for the rural district council.—Mr. W. W. Shennan, 9 Hamilton-square, Birkenhead.

RADCLIFFE—BURY.—February 13th.—For the extension of the sewerage systems, for the Radcliffe Urban District Council and the Bury Rural District Council.—Mr. W. L. Rothwell, engineer, Radcliffe.

HAMBLEDON.—February 13th.—For the removal of refuse, for the rural district council.—Mr. F. Smallpeice, clerk, 138 High-street, Guildford.

MANCHESTER.—February 13th—27th.—For sewage disposal works extension, for the Rivers Department.—The Secretary, Rivers Department, Town Hall.

BLEAN.—February 15th.—For the construction of stoneware pipe sewers, manholes, and other works, for the rural district council.—Mr. F. A. Ward, engineer, Roseneath, Eddington.

KEYNSHAM.—February 15th.—For the construction of sewers and manholes, for the rural district council.—Mr. H. M. Bennett, surveyor, 36 Corn-street, Bristol.

LANCHESTER.—February 15th.—For scavenging No. 2 district, for the rural district council.—Mr. J. R. Lupton, surveyor.

THIRSK.—February 15th.—For the removal of house refuse, for the rural district council.—Mr. A. Green, Holmefield-terrace, Sowerby.

CROYDON.—February 15th.—For the supply of 1,040 tons of broken filling for the new percolating filters at South Norwood farm, for the corporation.—Borough Engineer.

EAST GRINSTEAD.—February 17th.—For the construction of storm-water drains, for the rural district council.—Mr. C. Turton, surveyor.

LANCASTER.—February 18th.—For emptying cesspools, for the rural district council.—Mr. Littlefair, sanitary inspector, 5 Dalton-square, Lancaster.

CHERITON.—February 22nd.—For the removal of house refuse, for the urban district council.—Mr. A. Atkinson, acting clerk.

WOKING.—February 22nd.—For the construction of three screening chambers and detritus tanks, three sedimentation tanks, fifteen circular bacteria beds, provided with automatic distributors, six humus tanks, various lengths of effluent carriers, engine-house, sludge pump and press-house, and engine-houses for driving screens and pumping humus, and other works, for the urban district council.—Mr. G. Midgley Taylor, Caxton House, Westminster, S.W.

Stores.

CLEETHORPES.—February 8th.—For the supply of chalk, granite, concrete flags, bottoming macadam, topping macadam, straight York kerb, straight York channel, granite radius kerb, granite radius channel, ordinary pipes, new gullies, standard pipes, and ordinary pipes, for the urban district council.—Mr. C. H. Waithman, Council House, Cleethorpes.

WOOLWICH.—February 10th.—For the supply of ballast, sand, brooms, brushes, wheel barrows, drain pipes, forage, granite kerb, harness, ironmongery, road material, sewer ironwork, and timber, for the borough council.—Mr. J. Rush Dixon, borough engineer, Town Hall, Woolwich.

RICHMOND (Surrey).—February 12th.—For the supply of [illegible] clothing, [illegible], ironmongery, bass brooms, brushes, granite, granite siftings, broken chalk, brown pit flints, crushed shells, granite kerb, channel, setts, York kerb, flagging, Portland cement, grey lime, artificial stone paving, harness, stable requisites, tar, tarred macadam, wood blocks, oils and paints, for the corporation.—Mr. J. H. Brierley, borough surveyor.

HALIFAX.—February 13th.—For the supply of paving setts, flags, kerb, granite, limestone chippings, lime, Portland cement, gravel, sand, earthenware pipes, granite paving setts, artificial flags, horse provender, coal, castings (manhole covers, gullies, and name plates), wrought iron, shovels, picks, ironmongery, oils, paints, candles, gunpowder, cotton waste, gaskin, brooms, brushes, timber, precipitants for sewage, [illegible], and labour, for the corporation.—Mr. James Lord, borough engineer.

ECCLES.—February 15th.—For the supply of setts, flags, kerbs, broken rubble, broken slag, granite macadam and chippings, prepared tar slag, prepared tar limestone, limestone cube chippings, gravel, cinders, castings, pitch, creosote, tar, Simpson's patent street gullies, stoneware passage gullies, stoneware pipes, bends and junctions, mortar, and channel stones, for the corporation.—Mr. Thomas S. Picton, borough surveyor, Eccles.

SURBITON.—February 15th.—For the supply of team labour, broken Guernsey granite, concrete paving flags, general stores, repairing burst and damaged water pipes, cast-iron goods, tools, smiths' work, Derbyshire limestone, tar-paving materials, house refuse removal, Norway granite kerbing, Norway granite paving setts, Kent flints, gravel, Thames ballast, scavenging, slag tarred macadam, scavengers' brooms, horse sweeping brooms, machine brooms, lubricating oils, and sludge press cloth, for the urban district council.—The Surveyor, Council Offices, Ewell-road, Surbiton.

RAWTENSTALL.—February 17th.—For the supply of road metal, earthenware pipes, gullies, timber, pitch, creosote oil, disinfectants, Portland cement, iron castings, local stone, workmen's tools, scavenging brushes, horse-shoeing, coal and coke, for the corporation.—Borough Surveyor.

STOKE-ON-TRENT.—February 20th.—For the supply of Portland cement, blue paving bricks, common bricks, sanitary pipes, gullies, macadam, chippings, pitch, creosote oil, cast ironwork, picks, shovels, general ironware, paints, oils, brooms, brushes, bath towels, dusters, ironmongery, general stores and disinfectants, for the corporation.—Borough Surveyor.

MANSFIELD.—February 22nd.—For the supply of granite, slag, tar-macadam, natural flags, kerbing, channelling, concrete flags, Portland cement, stoneware pipes, junctions, bends, timber, sewer ironwork, castings, coal, ironmongery, general stores, paints, oils, varnish, brooms, brushes, disinfectants, and harness, for the corporation.—Mr. Thos. P. Collinge, borough engineer and surveyor.

SOUTHALL-NORWOOD.—February 23rd.—For the supply of granite, lime, cement, oil, alumino-ferric, waste, press cloth, disinfectants, tools, picks, shafts, dust-bins, Kentish pit flint, hoggin, gravel, horse hire, steam rolling and scarifying, forage, coal, and coke, for the urban district council.—Mr. Reginald Brown, engineer and surveyor, Town Hall, Southall.

SOUTHEND-ON-SEA.—February 24th.—For the supply of stoneware pipes, bends, flints, bricks, gravel, sand, timber, ironmongery, paints, oils, colours, cement, lime, chalk, team labour, forage, tar-paving, tar-macadam, iron castings, granite kerb, channel, broken Guernsey granite, broken granite, pitch, creosote oil, harness supplies, sundries, brooms, brushes, steel, iron, and disinfectants, for the corporation.—Mr. Ernest J. Elford, borough engineer.

SOUTH SHIELDS.—February 27th.—For the supply of Northumberland whinstone, Fifeshire whinstone, Aberdeen and Norwegian granite, slag, granite chippings, Caithness flags, Portland cement, cement-concrete flags, cast ironwork, shovels, scavengers' brooms, machine brooms, coal, coke, disinfectants, leather hose, sewer boots, jackets, sanitary pipes, paints, paint oils, glass, timber, iron, horseshoe nails, cart axles, springs, tar, pitch, oils, and general stores, for the corporation.—Mr. Leslie Roseveare, borough engineer and surveyor.

MARYLEBONE.—March 1st.—For the supply of road materials, horses, harness and drivers, Portland cement, oils, stoneware sewers, ironwork for sewers, and stopping, for the borough council.—Mr. J. Paget Waddington, borough surveyor.

EPSOM.—March 9th.—For the supply of sewerage ironwork, gully gratings, shovels, picks, brooms, forks, dust skeps, disinfectants, Portland cement, stoneware pipes and gullies, kerbing and channelling, setts, broken granite, chippings and limestone dust, tar-paving and tar-macadam, coal and coke, hay, corn, bran, straw, bricks, paraffin, artificial stone paving, Thames ballast, Thames sand, veterinary surgeon's services, tar, pitch, and team labour, for the urban district council.—Mr. Edward R. Capon, surveyor, Bromley Hurst, Church-street, Epsom.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the [illegible] of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance. ‡ Provisionally accepted.

[illegible]

[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	3,41
[illegible]	4,726
[illegible]	4,505

[illegible] for the [illegible] of the motor [illegible] the [illegible] road, [illegible] the county [illegible].

S. E. Moss, Southend-on-Sea	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	2,477
[illegible]	2,116
[illegible]	[illegible]
Stevens & Sons, Crouch Hill	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
R. Merton Hughes, West Kensington	2,295
A. Roberts & Co., Limited, Kensington	2,289
Rowley Brothers, Wood Green	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	2,157

Architect's estimate, £2,360.

LONDON.—For the erection of [illegible] shelter on the Victoria Embankment, near Blackfriars Bridge, for the county council:—

J. & C. Bowyer, Limited, Upper Norwood	£1,109
C. Wall, Limited, Chelsea	1,150
A. Roberts & Co., Limited, Kensington	962

Architect's estimate, £900.

LONDON.—For the reconstruction of Tredegar-road bridge, for the county council:—

Perry & Co. (Bow), Limited, Westminster, S.W.	£6,637
A. N. Coles, Plymouth	6,157
A. Fasey & Son, Leystonstone, E.	5,963
W. Muirhead & Co., Limited, Westminster, S.W.	5,671

Chief engineer's estimate, £5,800.

LONDON.—For paving [illegible] at Acreman-street and Smith's-square, Westminster, for the county council:—

H. Farrow, Brixton, S.W.	£4,923
Limmer Asphalte Paving Company, Limited, Westminster	4,590
Acme Flooring and Paving Company (1914), Limited, Victoria Park, N.E.	4,422
Val de Travers Asphalte Paving Company, Limited, Bishopsgate, E.C.	[illegible]
Improved Wood Pavement Company, Limited, Queen Victoria-street, E.C.	4,257
W. Griffiths & Co., Limited, Bishopsgate, E.C.	4,192
C. J. Anderson, Deptford	4,151
J. Mowlem & Co., Limited, Westminster, S.W.*	4,07[illegible]

Chief engineer's estimate, £3,865.

ROCHDALE.—For making up certain streets, for the corporation.—Mr. S. S. Platt, borough surveyor:—

Contract No. 448.—S. Kearsley, Rochdale.
Contract No. 449.—R. Lomax, Eccles.

WEST SUFFOLK.—For the construction of a 6-in. stoneware drain, soakaway pit, and other works, for the county council.—Mr. W. L. Jenkins, county surveyor:—

M. Froud, Brandon, Suffolk, £53.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

FEBRUARY.

5 Institution of Municipal and County Engineers. Meeting at 92 Victoria-street, S.W., 8 p.m.

9 Institution of Civil Engineers. Mr. F. D. Lucy, Assoc.M.Inst.C.E., on "Engineering Operations for the Prevention of Accidents." 8 p.m.

11 Society of Architects. Mr. A. Alban H. Scott on "The Construction and Protection of Buildings in Relation to Fire." 7.30 p.m.

13 Institution of Municipal Engineers. Northern District Annual Dinner, Newcastle-on-Tyne.

19-20 Royal Sanitary Institute. Meeting at Manchester.

23 County Councils Association. Annual Meeting. 3 p.m.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

COUNTY COUNCIL OF NOTTS.
APPOINTMENT OF COUNTY SURVEYOR

The County Council of Notts are desirous of receiving applications for the office of County Surveyor. The person appointed will be required to reside in or near to the Town of Nottingham, and to devote the whole of his time to the discharge of the duties of the office. He will not be allowed to engage in any private practice.

The salary will be £750 per annum, and in addition, travelling expenses will be paid.

Applications, marked "County Surveyor," with copies of not more than three recent testimonials, must be made upon Form, which will be forwarded by me upon receipt of an addressed foolscap envelope.

The application must reach me not later than midday on Saturday, the 27th day of February, 1915.

Canvassing is strictly prohibited, and will be deemed a disqualification.

(By order)

H. HAMPTON COPNALL,
Clerk of the County Council.

Shire Hall,
Nottingham.
February, 1915. (2,306)

BOROUGH OF HERTFORD.
APPOINTMENT OF ROAD FOREMAN

The Corporation of Hertford invite applications from persons with Macadam experience, from 30 to 40 years of age, for the appointment of Road Foreman.

Applicants must be thoroughly practical in the construction and maintenance, paving, steam rolling, tarring, [illegible] and capable of taking charge of and superintending a staff of men, horses, plant, &c.

The person appointed will have charge of the indoor staff and horses of the Corporation, and will work under the direction and instructions of the Borough Surveyor. He will be required to work the [illegible] and [illegible] Wages 32s. per week. Use of house at the Corporation Depot, rates, taxes, and water free.

Further particulars and [illegible]

[illegible] stating age, experience, and [illegible] to the Borough Surveyor, The Castle, Hertford.

Applications, in candidate's own handwriting, must be accompanied by three recent testimonials (originals to be produced if required), to be sent addressed to the undersigned, and endorsed "Road Foreman," not later than the 16th February, 1915.

Canvassing will be a disqualification.

ALFRED BAKER,
Town Clerk.

The Castle, Hertford.
January 28, 1915. (2,319)

BOROUGH SURVEYOR'S (TEMPORARY) ASSISTANT.

Chorley Corporation.—Required at once, to replace Assistant already enlisted. Salary £2. Must be good Draughtsman, Surveyor, &c. Preference will be given to applicants with Municipal experience.

Applications, giving full particulars of experience, with copies of two testimonials, to be sent to

THE TOWN CLERK,
Chorley,

not later than Friday, February 12th. (2,318)

WANTED, Surveyor, with road-making experience. Preference given to one who has passed Civil Engineer or Inst. Mun. Engineers. State age, salary and experience. Address X. S. 686, Messrs. Deacon's, 7 Leadenhall-street, E.C. (2,322)

APPOINTMENTS WANTED.

A GENTLEMAN, having a high class of education, desires to meet with Engagement as Assistant Surveyor, &c., generally, or as Assistant Surveyor and Inspector of Roads. Moderate salary to commence. Box 1,502, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,299)

PUBLIC SCHOOLBOY wishes to be Articled to a Municipal Engineer and Surveyor. Moderate premium. Box 1,503, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,331)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BRIDGNORTH RURAL DISTRICT COUNCIL.

The Council are prepared to receive Tenders for the Supply of Granite, Basalt, and Slag for the year ending 31st March, 1916. Tender Forms and [illegible] to be obtained on application to the Surveyor, Oldbury, Bridgnorth. Tenders to be sent in on or before Thursday, the 25th day of February next, marked "Tender for Road Material."

Dated February 2nd, 1915. (2,327)

SOUTHALL-NORWOOD URBAN DISTRICT COUNCIL.

ANNUAL CONTRACTS

From 1st April, 1915, to 31st March, 1916.

The Council invite Tenders for the Supply of—

Granite (Guernsey and Leicestershire).
[illegible] Gravel.
Cement.
Oil, Price's (Gas-engine Oil).
Alumino-ferric.
Waste.
Press Cloth.
Disinfectants (Carbolic Powder and Acid).
Tools & Plant (Shovels, Brooms, Broom Handles, Pick-shafts, Dustbins, &c.).
Kentish Pit Flints, Hoggin and Gravel.
Horse Hire.
Steam Rolling and Scarifying.
Forage.
Coal (house) and Coke.

Forms of Tender and particulars may be obtained at the Offices of the undersigned, any day between the hours of 10 a.m. and 4 p.m. (except Saturdays, 10 a.m. to 1 p.m.), or Forms will be supplied for the above items.

Tenders, sealed and endorsed "Tender for ——," are to be delivered to the Clerk of the Council not later than 4 p.m. on Tuesday, 23rd February, 1915.

The Council do not bind themselves to accept the lowest or any Tender, and may accept part or parts of any Tender.

REGINALD BROWN,
M.INST.C.E., M.I.MECH.E., F.S.I., &c.,
Engineer and Surveyor to the Council.

Town Hall,
Southall.
February 1, 1915. (2,317)

SOUTHALL-NORWOOD URBAN DISTRICT COUNCIL.

SOUTH-ROAD AND NORWOOD-ROAD

TO TAR-MACADAM MANUFACTURERS AND CONTRACTORS.

The Council invite Tenders from Manufacturers of Tarred Macadam for—

(1) The Supply and Delivery at Stores [illegible] on Tarred Slag-macadam or

(2) Preparing Road Surface, Supplying and Laying Material approximately 24,000 sq. yds.

Specification may be seen, and Forms of Tender obtained at my Office between the hours of 10 a.m. and 1 p.m. on Saturdays at noon, 10 a.m. and 1 p.m.

Sealed Tenders in the envelopes supplied and indorsed "Tender for Tar-macadam [illegible]" to be delivered to the Clerk to the Council not later than 1 p.m. on Tuesday 23rd February, 1915.

The Council do not bind themselves to accept the lowest or any Tender, and the acceptance will be subject to the approval of the Local Government Board, and the approved sketch, and to the approval of the Local Government Board.

REGINALD BROWN,
M.INST.C.E., M.I.MECH.E., F.S.I., &c.,
Engineer and Surveyor to the Council.

Town Hall,
Southall.
February 1, 1915. (2,316)

SOUTHALL-NORWOOD URBAN DISTRICT COUNCIL.

HOUSING SCHEME.

PRELIMINARY NOTICE.

The above Council are about to proceed with the Erection of 24 Houses, and to purchase [illegible] the necessary Materials required in the construction of the houses, and also to let by Tender the labour required in the [illegible]. Persons desiring of submitting prices are invited to send their [illegible] to the undersigned within two weeks from the date hereof. The Council do not bind themselves to accept the lowest or any Tender, and all Contracts entered into will be subject to the statutory provisions in force relating to Contracts with Local Authorities, and also to [illegible] Contractors [illegible] the Council pay [illegible] the Local [illegible] labour to be carried out in the Schedule adopted by the Council.

REGINALD BROWN,
M.INST.C.E., M.I.MECH.E., F.S.I., &c.,
Engineer and Surveyor to the Council.

Town Hall,
Southall.
February 1, 1915. (2,315)

CORPORATION OF RAWTENSTALL.

TENDERS FOR MATERIALS, LABOUR, COAL, COKE, PRINTING, STATIONERY, NEWSPAPERS AND MAGAZINES.

The Corporation of Rawtenstall invite Tenders for the supply of the following:—

(1) Road Metal, Earthenware Pipes, Gullies, Timber, Pitch, Creosote Oil, Disinfectants, Portland Cement (British), Iron Castings, Local Stone (Flags, Setts, &c.), Workmen's Tools, Scavenging Brushes, Horse Clothing, Coal and Coke, also for the Carting of Road Metal from the Railway Stations, and for Team Labour.

(2) Printing and Stationery required by the various departments.

(3) Newspapers and Magazines required for the Public Library.

Forms of Tender can be obtained on application to the Borough Surveyor, Town Hall. Sealed Tenders, endorsed with the names of the articles tendered for, must reach the Town Clerk's Office, Rawtenstall, not later than Wednesday, the 17th instant. The Corporation do not bind themselves to accept the lowest or any Tender.

N.B.—Tender Forms will not be issued unless applied for, and no Tender will be considered that is not delivered within the prescribed time.

(By order)
JAMES WHALLEY,
Town Clerk.

Town Hall, Rawtenstall.
February 4, 1915. (2,325)

COUNTY BOROUGH OF CROYDON

SEWAGE WORKS EXTENSION SOUTH NORWOOD FARM.

CLINKER FILLING.

Notice is hereby given that the Council are prepared to receive Tenders for the Supply and Delivery of about 4,400 tons of Clinker Filling for the New Filter Beds at the Sewage Disposal Works, South Norwood Farm.

Conditions, Particulars, Specification and Form of Tender may be obtained at the Borough Engineer's Office, Town Hall, Croydon, upon payment of a deposit of One Guinea, which will be returned upon [illegible]

[illegible] by eleven o'clock in the forenoon of Monday, the 15th day of February, endorsed "Tender for Clinker [illegible] South Norwood Farm."

Tenders will only be received subject to the terms of the Draft Contract deposited at my Office, and which may be inspected during office hours.

The Council will not be bound to accept the lowest or any Tender.

JOHN M. NEWNHAM,
Town Clerk.

Town Hall, Croydon.
January 27, 1915. (2,311)

RURAL DISTRICT OF CLAYPOLE

TENDERS FOR ROAD MATERIALS.

The above Council invite Tenders for the Supply of about 2,050 tons of Granite, 1,300 tons of Slag, and 150 tons of Footpath Gravel, to be delivered in such quantities and at such times and places in their district as the Council or their District Surveyor shall require and direct.

Sealed Tenders, marked "Tender for Road Material," to be delivered to [illegible] later than Thursday, the 18th February.

Samples must be delivered, free of expense, at the Board's [illegible] the 22nd February.

The Council [illegible] lowest or any Tender, and they reserve to themselves the right to accept such part of any Tender as they may deem proper.

The Contractor will be required to enter into a bond for the due fulfilment of his Contract.

Further particulars may be obtained upon application to the Deputy Surveyor, Mr. F. A. Watson, 13 Millgate, Newark, and Tenders must be sent in a [illegible] and addressed foolscap envelope.

(By order of the Council)
A. J. FRANKS,
Clerk.

Union Offices,
24 Lombard-street, Newark.
January 28, 1915. (2,312)

CITY OF SHEFFIELD

TO CONTRACTORS AND BUILDERS.

The General Purposes and Parks Committee of the City Council are prepared to receive Tenders for the Erection of Bowling-green Pavilions in Timber and Brick with Slate Roofs at Crookesmoor Recreation Ground, Whiteley Woods and Hillsborough Park, in the City of Sheffield.

Particulars and Forms of Tender, together with "Conditions of Contract," may be obtained from Mr. Charles F. Wike, M.INST.C.E., City Engineer, Town Hall, Sheffield, on and after Wednesday, February 3rd, on payment of the sum of £1, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, enclosed in official envelope provided, to be delivered at the City Engineer's Office not later than 10 o'clock a.m. on Monday, February 15th, 1915.

The "Conditions of Contract" above referred to provide [illegible] in compliance with the Council's Form of Clauses respecting wages, hours and conditions of labour, and prohibition against assigning or sub-letting.

The Committee do not bind themselves to accept the lowest or any Tender, and reserve the right to divide the works between several Contractors.

(By order)
WILLIAM E. HART,
Town Clerk.

Town Hall, Sheffield.
January 28, 1915. (2,314)

COUNTY BOROUGH OF STOKE-ON-TRENT.

The Council invite Tenders for the Supply of Materials and Goods for the year ending March 31st, 1916, as under:—

1. Portland Cement.
2. Blue Paving Bricks and Common Bricks.
3. Sanitary Pipes and Gullies.
4. Kerbs and Setts.
5. Macadam and Chippings.
6. Pitch and Creosote Oil.
7. Cast-iron Work.
8. Picks, Shovels, and General Ironware.
9. Paints and Oils.
10. Soap, Soda, &c.
11. Brooms and Brushes.
12. Bath Towels, Dusters, &c.
13. Ironmongery and General Stores.
14. Disinfectants.

Specifications, Conditions and Forms of Tender may be obtained on application to the Borough Surveyor, Town Hall, Stoke-on-Trent, and Tenders, sealed and endorsed, must be delivered to me on or before 20th February, 1915.

E. B. SHARPLEY,
Town Clerk.

Town Hall,
Stoke-on-Trent.
February, 1915. (2,320)

EVESHAM RURAL DISTRICT COUNCIL.

HARVINGTON WATER SUPPLY

CONTRACT No. 1.

The Evesham Rural District Council are prepared to receive Tenders for the provision, laying and jointing of about 3 miles of 4-in. and 3-in. cast-iron water mains, together with valves, hydrants, air valves, meter and necessary chambers in connection therewith, in accordance with the Plans, General Conditions and Specification prepared by the Engineers.

Plans and Specification may be seen at the Offices of the Engineers, Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham, from whom copies of the Bills of Quantities and Form of Tender may be obtained, on or after the 6th day of February, on payment of a deposit of Three Guineas, which will be refunded on receipt of a *bonâ-fide* Tender and the return of all documents to the Engineers.

Sealed Tenders, in envelopes supplied, and endorsed "Harvington Water Supply, Contract No. 1," to be delivered at my office not later than 9 a.m. on the 22nd day of February, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

By order)
E. H. WADAMS,
Clerk to the Council.

Union Offices,
Evesham.
February 1, 1915. (2,321)

COUNTY BOROUGH OF SOUTH SHIELDS.

TENDERS FOR MATERIALS.

The Corporation invite Tenders for the supply of the following Materials for the year ending 31st March, 1916 — viz., Northumberland Whinstone, Fifeshire Whinstone, Aberdeen and Norwegian Granite, Slag, Granite Chippings, Caithness Flags, Portland Cement, Cement Concrete Flags, Cast Ironwork, Shovels, Scavenger Brooms and Machine Brooms, Coal, Coke, Disinfectants, Leather Hose, Sewer Boots, Jackets, &c., Sanitary Pipes, Paints, Paint Oils, Glass, Timber, Iron, Horseshoe Nails, Cart Axles, Springs, &c., Tar, Pitch, Oils, and General Stores.

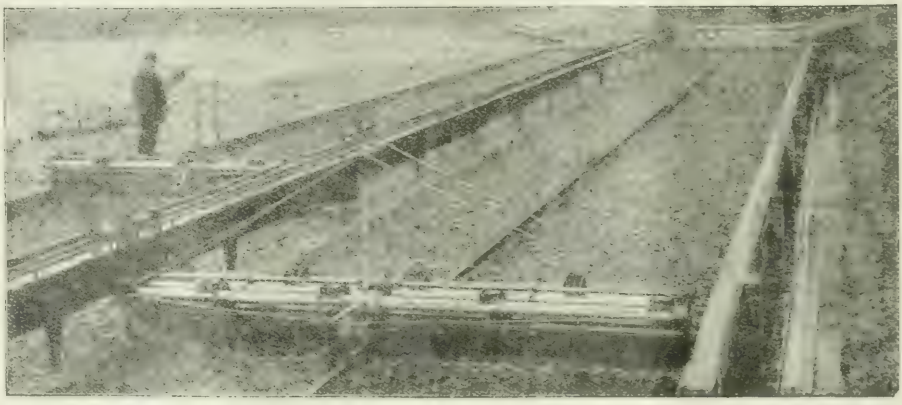
Specifications and Forms of Tender may be obtained on application to Mr. Leslie Roseveare, M.I.C.E., Borough Engineer and Surveyor, Municipal Buildings, South Shields.

Tenders, endorsed "Tender for Materials," to be delivered to the undersigned not later than 12 noon on Saturday, 27th February, 1915.

J. MOORE HAYTON,
Town Clerk.

Municipal Buildings,
South Shields. (2,324)

"J. & A." Patent Sewage Sprinklers



As Fixed at Oldham Corporation Sewage Works.

No Wind Troubles. No Complicated Mechanism. No Small Holes to Get Choked and Low Cost of Maintenance Guaranteed.

Write to-day for Illustrated Booklet Series S2.

Jones & Attwood, Ltd., Hydraulic Engineers, Stourbridge.

Telegraphic Address—"HEAT, STOURBRIDGE." Telephone No. 10.

BOROUGH OF MANSFIELD.

The Corporation of Mansfield invite Tenders for the Supply of the following Materials for a period of twelve months, ending 31st March, 1916 :—

1. Granite, Slag and Tarmac chips.
2. Natural Flags, Kerbing, Channelling and Concrete Flags.
3. Portland Cement.
4. Stoneware Pipes, Junctions, Bends, &c.
5. Timber.
6. Sewer Ironwork and Castings.
7. Coal.
8. Ironmongery and General Stores.
9. Paints, Oils, Varnish, &c.
10. Brooms and Brushes.
11. Disinfectants.
12. Supply and Repair of Harness.
13. Supply of Groceries, Provisions, Soaps and Sundries.
14. Butcher, Fishmonger, Baker, &c.

No Tender will be accepted from any person or firm paying to any workmen employed by him or them, whether on work for the Corporation or any other person, less than the standard rate of wages, or not complying with the recognised conditions of labour in the Borough.

Specification, Schedules and Form of Tender may be obtained on application to Mr. Thos. P. Collinge, ASSOC.M.INST.C.E., Borough Engineer and Surveyor, Market-street, Mansfield.

Sealed Tenders, endorsed "Tender for Stores," addressed to the undersigned, to be delivered on or before 12 o'clock noon on Monday, the 22nd February, 1915.

J. HARROP WHITE,
Town Clerk.

Mansfield.
February 2, 1915. 2,328

STEAM ROLLER.

Tenders invited for Strengthening the Wheels of a 12-ton Roller. Full particulars may be obtained, and Tenders to be sent to

J. SIDDALLS,
Borough Surveyor.

Town Hall,
Tiverton. (2,313)

Calno
Reg^d

THE ONLY FIRE-RESISTING FIBRE
BUILDING BOARD
MADE IN
GREAT BRITAIN

Does not Split or Crack. Bound with Cement Binder.
Tensile Strength over 300 lb. to the square inch.

TESTED AND CERTIFIED by the BRITISH FIRE-PREVENTION COMMITTEE.

PASSED by the L.C.C.

Fire and Damp Resisting.

Germ and Sound Proof.

Non-conductor of heat or cold.

Sanitary.

Over 5,000,000 (five million) Square Feet in use by H.M. Government.

Full particulars can be obtained from the manufacturers direct—
Address Dept. D, Thames Mills, Purfleet, Essex
Telephones { 11 Tilbury. / 22 Rainham. Telegrams "Boards, Purfleet."

THE FIREPROOF FIBRE BUILDING BOARDS, LTD.,
Telegrams "Asthmine, London." 26 Hart Street, London, W.C.

VOIDLESS
ASPHALT MACADAM

The Premier Road for Modern Traffic.

Dustless, Durable, Sanitary and Waterproof.

Write for Illustrated Booklet
"Voidless Asphalt Macadam."

HIGHWAYS CONSTRUCTION, LTD.,
FINSBURY COURT, LONDON, E.C.

EAST SUFFOLK COUNTY COUNCIL.

MAIN ROADS.

STEAM ROLLING.

The East Suffolk County Council invite Tenders for Steam Rolling during the financial year ending 31st March, 1916.

Specification and Form of Tender can be obtained on application to the undersigned.

Sealed Tenders, addressed to me, and endorsed "Tender for Steam Rolling," must be delivered at the County Hall, Ipswich, on or before the 17th day of February, 1915.

The Council does not bind itself to accept the lowest or any Tender.

W. JERVIS,
County Road Surveyor.

County Hall, Ipswich.
February 2, 1915. (2,329)

EAST SUFFOLK COUNTY COUNCIL.

MAIN ROADS.

TENDER FOR ROAD MATERIALS.

The East Suffolk County Council are prepared to receive Tenders from actual Quarry Owners or Proprietors for the supply of Road Materials for the three Districts in the County—namely, Ipswich, Halesworth and Eye—to the 31st March, 1916.

Specification and Forms of Tender can be obtained on application to the undersigned, and applicants are requested to state for which District they wish to tender.

Sealed Tenders, endorsed "Tenders for Road Materials," must be delivered at the offices of the County Road Surveyor, County Hall, Ipswich, on or before the 19th February, 1915.

The Council does not bind itself to accept the lowest or any Tender.

W. JERVIS,
County Road Surveyor.

County Hall, Ipswich.
February 2, 1915. (2,330)

DORSET COUNTY COUNCIL.

MAIN ROADS.

SUPPLY OF GRANITE.

The Roads and Bridges Committee invite Tenders for the Supply of Broken Granite, Basalt, Quartzite, Limestone, and Tar-macadam, delivered at the various Stations and Wharves in the County, for the year ending 31st March, 1916.

Tenders to be sent in not later than February 12th next to the undersigned, from whom Forms of Tender and other particulars may be obtained.

E. H. HABGOOD.

Roads and Bridges Department,
County Offices,
Dorchester. (2,325)

BEDFORDSHIRE COUNTY COUNCIL.

TENDERS FOR ROAD MATERIAL AND CARTAGE.

The Bedfordshire County Council invite Tenders for the Supply of the following:

1. Broken Granite.
2. Slag.
3. Flints.
4. Gravel.

And for the Cartage of Road Materials.

Particulars and Forms of Tender may be obtained at the Office of the County Surveyor, Shire Hall, Bedford, on and after the 11th February, 1915.

Sealed Tenders, endorsed "Tender for Road Materials," or "Tender for Cartage," must be delivered at the County Surveyor's Office not later than 12 o'clock noon on Saturday, the 20th February, 1915.

Samples must accompany the Tenders for Road Materials.

The County Council do not bind themselves to accept the lowest or any Tender.

W. W. MARKS,
Clerk of the Council.

Shire Hall, Bedford.
February 2, 1915. (2,326)

Specify

Mexphalte and Fluxphalte for your 1915 road work.

These materials have increased in sales and reputation during the past season. There is no shortage of supplies or increase in prices. Mexphalte is unrivalled for grouting work and for asphalte macadam. Fluxphalte is a liquid bitumen for road spraying. Prompt deliveries from stock at competitive prices.

ANGLO-MEXICAN PETROLEUM PRODUCTS CO., LTD.,
FINSBURY COURT, LONDON, E.C.

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. FEBRUARY 12, 1915. No. 1,204.

Minutes of Proceedings.

By-laws and an Appeal Court.

At the Royal Sanitary Institute Congress in 1913 a resolution was passed asking the council to urge upon the Local Government Board the desirability of establishing a tribunal to which appeals might be brought from decisions of local authorities on points relating to practice in the working of building by-laws. Up to the present the passing of this resolution has produced the desired result, and the matter was again ventilated at a meeting of the Institution of Municipal and County Engineers held on Friday last. The subject was introduced in a paper by Mr. H. D. Searles-Wood, F.R.I.B.A., on "Building By-laws and a Court of Appeal," which, together with a report of the discussion that followed, will be found in another column. The suggestion as outlined in the paper was that, in the event of a difference of opinion arising between the authority and the building owner as to the suitability of his design and the construction of the by-laws, the building owner should forward his drawings to the Local Government Board, with a statement of the comments put forward by the local authority should pass them, and the local authority should state their reason for objecting; and that the decision of the Local Government Board should be binding on all parties. The discussion, however, appears to have proceeded on rather different lines, and to have developed into a consideration of the question whether a tribunal should be constituted with power to modify or dispense with by-laws in particular cases. One of the speakers, Mr. Turner, after analysing the various classes of questions which can arise in the administration of by-laws, expressed the opinion that only if there were no by-laws, or if the by-laws could be dispensed with if it were thought desirable to do so in any individual case, would there be any work for the proposed court of appeal to do. In regard to the desirability of a dispensing power, there was practical unanimity. As Mr. Collins said, most surveyors desire to be reasonable, but so long as by-laws have to be administered rigidly, sometimes they are compelled to enforce requirements which they themselves regard as unreasonable in the circumstances of the case under their consideration.

The real difficulty lies in determining in what person or authority the power of dispensation should be reposed. To this question there are four possible answers. In the first place, it might be placed in the hands of the surveyor to the local authority. The objections to this course are so obvious as hardly to require statement. We need only mention here the great responsibility involved and the probability of conflict between the surveyor on the one hand and the builder, the architect, or the member of the local authority on the other hand. Next, the local authority themselves might be endowed with some discretionary power of dispensation. This appears to be hardly less objectionable. If the local authority acted on the advice of their surveyor, that official would be in almost the same position as if the ultimate decision rested with him alone. If they acted without consulting their surveyor, the power of dispensation would be exercised by a non-technical and possibly interested body. Then, it was suggested that the appeal might lie from the local authority to the county council. If we are to accept the word of Mr. Wakelam—and surely he is entitled to speak with authority—the county councils simply do [illegible] Mr. Collins, too, put it very strongly when he said that the county councils throughout the country would be the worst possible court of appeal.

Apart from the Metropolis, where all the circumstances are peculiar, the county councils have nothing to do with buildings, and we agree that, if any tribunal is set up, it should consist of a small number of persons, chosen on account of their expert knowledge of the matters they would have to consider, and having jurisdiction over as wide an area as practicable. The view of the meeting clearly was that, so far as local authorities and their surveyors are concerned, they must have an absolutely rigid code of by-laws to which they must adhere in all cases. We are inclined to agree with one speaker who said that the very difficult question of dispensation might be solved by the creation of an independent [illegible] which, in exceptional cases, some kind of appeal might be made.

*

Mr. Cole's Retirement.

The meeting of the Institution of Municipal and County Engineers which was held at headquarters last Friday evening was made the occasion of the presentation to Mr. Thomas Cole, formerly secretary, and now consulting secretary to the institution, of a handsome testimonial, to which upwards of 800 members had subscribed. The speech made by the president in handing the gifts to Mr. Cole was in every way worthy of the occasion. Referring to the identification of the late secretary with every stage of the growth and progress of the institution for the past thirty-three years, Mr. Pickering reminded the members that during that time the membership had increased no less than eightfold. There was general agreement, too, with the statement that during his long career Mr. Cole had had the entire confidence of each succeeding council, and the esteem of every single member of the institution with whom he had come into contact. The gifts, which took the form of a gold watch and chain and a cheque, together with a gold bracelet watch for Miss Cole, were handed to the recipient at the conclusion of the president's speech, and Mr.

Cole was very warmly received on rising to acknowledge them. In the course of his remarks he gave some account of the history and work of the institution during his long term of office. The development of the institution has resulted both from an extension of geographical boundaries and a broadening of the basis of membership. Originally the Association of Municipal and Sanitary Engineers and Surveyors under which name the institution commenced its existence—was only open to chief surveyors to local authorities in England and Wales. Now, however, the activities of the institution are commensurate with the boundaries of the British Empire, while classes of membership have been formed so as to enable deputy and chief assistant surveyors, as well as the younger members of the profession, to be included in its ranks. That part of the speech which dealt with the question of security of tenure was of peculiar interest. Mr. Cole recalled that interviews had been secured with no fewer than three Presidents of the Local Government Board, the last being with Mr. John Burns in 1914, to whom was handed a great mass of evidence of cases of hardship which had been collected by the institution. Mr. Cole paid a generous and well-merited tribute to the assistance he had always received from Mr. Giles, the assistant secretary, and other members of his staff, and congratulated the council on having secured the services of a thoroughly competent man in the person of Mr. Robinson as the new secretary. Finally, Mr. Cole spoke briefly of the future of the institution, to which he looked forward with every confidence. The whole speech was very eloquently delivered, and was listened to with the greatest attention, and were it not for the necessarily widely scattered nature of the membership of the institution, we are confident that a much larger room would have been required to contain those who would have been present. As it was, the proceedings were marked with great cordiality, and the general feeling was that the institution was to be congratulated on retaining the services of Mr. Cole as consultant and honorary secretary and member of the council.

* * *

Slag Concrete. The American Society for Testing Materials recently had under consideration a most interesting paper in which was discussed the suitability of slag as an aggregate in concrete. The question is one of considerable commercial importance both in the United States and this country, for if it can once be established that furnace slag may be freely used for this purpose a great outlet will have been found for a waste product, the handling and disposal of which entail considerable expense. Mr. W. A. Aiken, who read the paper in question, was able to report the result of extended experiments which he had carried out for the purpose of comparing the strengths of coarse aggregates consisting of limestone, Trap-blue trap rock, and slag respectively. The original tests were made on specimens which had been allowed to set for twenty-eight days, and it was in consequence of the very favourable way in which slag compared with the other materials used that more extended experiments were made later on. For this purpose no fewer than 500 6-in. cubes were manufactured, the intention being to test some of them at periods of one, three, six, nine, and twelve months respectively. As regards the test conditions, Mr. Aiken stated that the materials used were all commercially procured in Philadelphia, and that the work of making the specimens was no better than that under ordinary field conditions of concrete construction—no attempt having been made to enter into any elaboration. The main object of the investigation was to determine whether the compressive strength values developed were sufficiently great to warrant the employment of slag as an aggregate, in competition with broken stone or gravel, and this question Mr. Aiken answers in the affirmative. He concludes that from the actual strength of the concrete developed in these tests—its weight per cubic foot (which is less than that of most materials used similarly); the recognised solubility of slag, which permits it to act as a puzzolanic material; its alkaline nature, which is especially conducive to rust-prevention in the case of reinforced concrete construction; and from the relatively high combined percentages of silica, alumina, and iron, which make for permaneney of the resulting concrete—slag of similar constitution to that experimented upon is in every way satisfactory for use as aggregate in concrete.

* * *

The Cleaning of Water Mains. It is interesting to note the slow and gradual development of methods for cleaning water mains. The development has been slow, but the adoption has been slower. However, the number of water authorities who are making use of the method is increasing, and the method itself is being perfected. The chief reason why the scraping of mains has not been more generally adopted is that it has been considered too expensive for application. When this is the case the chief reason is to be found in the fact that mains have not been laid with hatch-boxes or facilities for cleaning, and the cost and trouble of inserting the scraper therefore becomes a serious matter. Where, however, the mains have once been scraped and provision made for subsequent cleaning, the cost of the periodical scraping is not great. Where the alternative is to lay a new system of pipes it is sufficiently evident that the outlay on cleaning must, under most conditions, be well worth while, and that it is ignorance of the merits of the process rather than its cost or difficulty which is the chief reason why it is not more readily adopted—for the cost of cleaning must be great indeed if it is comparable to that of laying a new main.

Without quoting figures available from the many cases of which records have been kept, it is certain that the cost of severing a main in a few places and of employing a few workmen with the necessary appliances for a few days cannot possibly equal the cost of a new pipe line. On the contrary, the cost of cleaning can be only a fraction of the cost of the pipe. Machines used for the purpose are of several kinds. First there is the scraper which is pulled through the pipe, generally used for small mains; then there is the machine which is driven forward through the main by the pressure of the water; and recently the turbine machine has been used. In the last-mentioned case the water pressure forces the machine through the pipe, and causes cutters in front of the machine to revolve. The efficiency of such a machine depends to a great extent upon the water pressure. The possibilities of useful working, especially at the top end of a main near the reservoir, might possibly be increased by the use of a pump. The improvement in principle is clear, and is an interesting step in the development of methods of main cleaning.

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Fire Precautions and the War Emergency. The British Fire Prevention Committee's special organisation to meet the war emergency completed its first half year's work this week. The work comprised mainly an extensive issue of fire warnings; the formation of a technical enquiry office to deal with all manner of technical enquiries; the formation of a special fire survey force of eighty honorary fire surveyors entrusted with special duties; and the formation of a special fire service force of 300

fire brigade officers and men available for mobilisation at short notice. No fewer than 105,000 "fire warnings" in the form of small posters have been issued by the committee and distributed either directly or through the Government departments and other public authorities concerned. Such "warnings" were specially prepared for military hospitals and refugee hostels, translations in French and Flemish also having been made available for Belgian wounded and Belgian refugees. There were "fire warnings" for farmers as to grain storage, for troops billeted and for factories engaged on Government supplies. In many cases trade associations were afforded facilities for reproducing the warnings for use among their own members and subscribers, while some 400 daily newspapers and technical journals have reproduced the warnings in part or whole. The technical enquiry office has dealt with many hundreds of cases, some of considerable complication. The fire survey force has dealt with some 200 surveys, and these surveys have occasionally required the inspection of as many as fifty individual buildings. Several patrols have already been requisitioned from the fire service force. The whole of the services provided by the committee, as far as the professional men assisting are concerned, have been rendered gratuitously, the paid staff being limited to a small clerical staff at the headquarters in London. Over 200,000 postal items have had to be dealt with, and the districts covered include not only Great Britain and Ireland, but the various stations in the Mediterranean and Egyptian Protectorate.

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The High-speed Gas Engine.

The advantages which the high-speed gas engine possesses for direct coupling to centrifugal pumps, particularly in connection with works of sewerage or drainage, renders a consideration of its merits of special interest to municipal engineers. The subject was very ably dealt with in a paper read by Mr. F. Embleton, of Manchester, at the last meeting of the Junior Institution of Engineers. Mr. Embleton pointed out that the ease and rapidity with which these engines can be started up is of great advantage, particularly in installations for the prevention of floods, or in sewage works, where, in the event of a sudden downpour of rain, they can be started up immediately to deal with the flood water and relieve the main sewers. Several large installations have been put down for this purpose by the London County Council, consisting of vertical gas engines coupled to centrifugal pumps, and using town's gas, which is always ready on tap; and as their use is only occasional, and for relatively short periods, the cost of gas does not much matter. Generally speaking, the high-speed gas engine may be said to be reliable, regular in speed, and economical in running. Neither boiler nor chimney-stack are required, while the absence of vibration is an additional advantage. The initial cost of this type of engine is rather higher per rated horse-power than that of the slow-speed type, although some allowance should be made on account of its compactness and the consequent saving in space and housing. The running cost, however, is comparatively low, although the actual saving will vary with the size of plant, type of engine and boilers, and last, but not least, the price of coal. We commend to the attention of our readers the full extracts from Mr. Embleton's paper, which will be found in another column in this issue.

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Cast Iron or Steel Pipes.

The controversy which has raged as to the relative merits of cast iron or steel pipes has been chiefly between manufacturers. It would probably have received little attention but for the fact that the Local Government Board clearly regards the life of the steel pipe as being considerably less than that of the cast-iron pipe. Notwithstanding this, the use of the steel pipe in this country has increased enormously, and the road last year was exceptionally good, even under the present particularly difficult conditions. The lake in St. James's Park has a concrete bottom, on which a long line of coated steel water pipes were laid some years ago. This lake has been empty of water for some time past, and the pipes are exposed for their whole length, and it is possible for the observer to see the extent to which the coating has preserved the outside of the pipes—which are generally covered by the water.

Experience certainly points to the fact that the corrosion of pipes, whether of iron or of steel, depends upon the quality of the water. There are very many instances of the serious corrosion and failure of cast-iron pipes and of the corrosion and failure of steel pipes. The use of either pipes must depend upon a number of conditions which the engineer must take into account, and before he can come to a right decision he may need the assistance of the chemist and possibly even that of the bacteriologist. The saving in cost is evident with the steel pipe, and its life is dependent entirely upon the quality of the water passing through it and in a lesser degree upon its coating. It is also dependent to some extent upon the character of the ground in which it is laid, but the outer coating, being thicker and open to inspection, may be made in such a manner as to afford efficient protection. Whether the use of cast-iron pipes is sometimes justified by habit rather than by expediency should be considered. A considerable saving of expense is not to be ignored. If the cast-iron pipes were made twice as heavy they might last longer, but the expense would not be justified. It may be asked whether the cost of the heavy cast-iron main in place of the steel pipe is justified either.

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Snow Removal.

A discussion as to the methods to be adopted in dealing with a fall of snow cannot yet be considered as unreasonable, and so we venture to direct the attention of our readers to the conclusions of a special committee which was appointed to submit a report on the subject at a recent conference of street-cleaning officials at Philadelphia. These conclusions are seven in number, and may be stated quite shortly. First of all, the plan of organisation and the system to be employed should be worked out in advance of the snowy season. Next, the work of removal should commence as soon as the snow has covered the pavements, and, the indications pointing to the storm continuing, the operations should be carried on continuously. Further, it is recommended that the carrying capacity of the sewer system should be utilised as far as possible to get the snow away from the streets. This at once reduces both the handling and haulage of the material. As regards the class of labour to be employed, the committee state that, when practicable, where there is only a small area to be cleaned, the work should be performed directly by the local authority by day labour. This method is not only flexible and capable of easy administration, and it avoids the necessity for the checking and measurement which are required in the event of the employment of contractors. The committee also call attention to the desirability of co-operation with haulage contractors and the police force, and of securing, as far as possible, the assistance of householders. These general principles, having been determined by a committee of experts, are worthy of the careful consideration of those responsible for the work of snow removal in this country.

Foundations—the Main Factor in all Road Work.*

By J. A. JOHNSTON, Division Engineer, Massachusetts Highway Commission.

What to use for foundation, where, how and when to use materials, and in what quantity, is the science of road building. Many men have attained enviable reputations as road builders, based mainly on the fact that their work was all done in a locality which was blessed by Nature with favourable soil conditions.

In our earlier work in Massachusetts it was our practice to use foundations only in such locations as were unquestionably bad, and to take a chance on places regarding which we were in doubt. We believed it was cheaper later to strengthen the weak places than to use extra material that might not be necessary. Under conditions then existing, with comparatively light horse-drawn traffic, and with mainly gravel and water-bound macadam surfaces, this "take-a-chance" policy seemed a reasonable one, but no one could predict the future developments, and I doubt if we have actually saved any money by such attempts at economy.

Many road materials have been unjustly condemned when the real fault lay in the foundation, and not in the surface material. There are many companies advertising their road materials as the final solution of the road problem, when, as a matter of fact, their specialities are merely surfacing propositions, many of which would give excellent results if used over a proper base, but are far from being the whole road, as one might infer from their claims.

WATERPROOF SURFACES.

The statement has many times been made that a waterproof surface requires little or no foundation, because no water can get through it to the soil beneath, and so the base is kept dry. Many cases might be cited to show the fallacy of this belief. A little consideration of the capillary action of the soil which draws water from the sides of the road and underground sources (as well as the water that will seep through the soil from higher points) will show that a waterproof surface is not built well without a proper base. It must be understood that each road is a problem in itself, and no standard treatment can be devised that will fit all conditions. There are many factors entering into the problem—soil, drainage, traffic, available material—all should be considered.

In some localities good gravel can be had at a low cost, but there are many places where good gravel would have to be hauled many miles, and the cost would be prohibitive. In other places stone is abundant and cheap, while in others there seems to be no material fit for foundation purposes.

It is true that if you can obtain the right kind of gravel it makes an excellent foundation, but to give the best results it should be absolutely free from clay, loam or silt, and rather sandy. For instance, on such a base we have built macadam roads with only 3 in. of broken stone. There were a few soft spots in the spring where pockets of loamy gravel were found, but these were taken out when the road developed, and one such road, which carried a considerable traffic on the edge of a thickly settled town, was kept in excellent condition at a low cost for maintenance for twelve years before it was resurfaced. In another place we built a section of road over a very soft bottom (practically quicksand) by first placing a bed of gravel 18 in. deep, and over that 6 in. of macadam. This road has been built sixteen years and has given no trouble. On the other hand, we have many miles of road built on gravel bases 6, 12 and 15 in. in some cases 18 in. deep, that soften up and are badly broken up in the spring when the frost is coming out. It is our practice carefully to locate all soft spots in the spring, so that when funds are available for improving such roads we may intelligently do so without guesswork.

Most gravel contains enough silt, loam, or clay so to draw moisture by capillary attraction that the frost will work in it, and, of course, when the frost crystals thaw, it leaves the particles spongy and wet. This condition is aggravated by the rolling which packs only the surface and the pounding action of horses' hoofs, which all tend to puddle it, just as a [illegible] puddles the soil.

* Paper presented at the annual meeting of the American Road Builders' Association held in Chicago recently.

time from below. Such a result, unless extreme, may not be serious if your road surface is of gravel or even water-bound macadam, for such surfaces are easily and cheaply repaired, but if the road surface is a high-cost bituminous mixture it may be ruined, and you cannot afford to take such chances. It should, however, be borne in mind that a road may stand two or three years over a poor bottom with little apparent trouble, but almost entirely go to pieces the third or fourth year. This fact has caused a great deal of trouble, for the inexperienced man, finding that a road stands all right the first year, and assuming that it will continue to do so, proceeds with the same type of construction under similar conditions until the first fails and the whole road is ruined.

Gravel alone cannot always be trusted for foundation, and should never be used under a high-cost surface except as a substitute under some foundation or concrete.

SUBSOIL DRAINAGE.

In our earlier work we depended largely on side drains built 3·5 ft. deep at the edges of the macadam. A 5-in. pipe was placed in the lower part of the trench, and the drain filled with small stone fragments. Our theory was that these drains would dry out the sub-grade and keep the road surface firm. We built miles of these drains, but they did not accomplish the desired results unless they were supplemented by a stone base under the macadam, and subsequent experience has shown that, except in rare cases, if the road is built over a proper stone foundation, the side drain is unnecessary.

One of John Macadam's theories was that no stone larger than you could hold in your mouth should be used in a road. Now I have a large mouth, but it won't hold as large a stone as experience has proven to give satisfactory results for foundations in Massachusetts.

In the last twenty years we have tried many methods of subsoil drainage and many different forms of foundation. On some of our macadam roads with crushed stone 6 in. thick the road has, after one or two years, softened up badly in the spring. We tried the experiment of adding more crushed stone, without breaking up the old surface. In some cases we added 12 in. of new stone, making a total of 18 in. of stone fragments not exceeding 2½ in. in their largest diameter, and also built ground water drains each side of the macadam, and cross drains at 50-ft. intervals. The result was a failure; after two or three years the road broke up as badly as ever. As these results were obtained in several places, I think we have proven that crushed stone of small size is not satisfactory for foundation, and is suitable only for surfacing. My theory is that the units are so small they have little bearing, and, having no cohesion, when wet they sink readily into the mud. Regardless of theory, the fact remains; and some of these stone particles have been found 1 ft. or more below the original sub-grade. It should also be borne in mind that the cost of the crushed stone is nearly three times that of the larger fragments.

When we first began building our roads, if we found a place which seemed to need a stone foundation we used a telford paving 8 in. deep over 6 in. of gravel. The telford stones were set up on edge, the tops broken off to a true cross-section, and the joints wedged up and chinked. French drains, 3·5 ft. deep, were built at each edge of the road. A year or two later the specification was changed, and the telford was only 6 in. thick over 2 in. of gravel, with the continued use of the side drain. Later we [illegible] the standard roll to [illegible] adopted the V drain, so called because it was roughly the shape of a broad V, about 18 in. deep in the centre and 4 in. at the sides, with stones not over 8 in. in their largest diameter. This V drain is a combination of foundation and drain. The water flows in a channel in the centre of the road, and is led off by bleeders to proper outlets. We built many miles of these drains on foundations only 10 ft. wide under macadam 15 ft. wide. This gave satisfaction in the earlier days, as the traffic did not spread over more than 10 ft. except when passing another vehicle.

While this practice was satisfactory under the old

conditions, it has now been decided that [illegible] is found that, at the high speed now at present being run in passing, the whole width of the road is used. In fact, on our main roads we have now arranged to increase the width of the hardened surface from [illegible] to 18 ft.

One objection to the V drain is the fact that, owing to the extra depth of stone at the centre of the road, the frost action is greatest at that point and the edges where the drain is shallowest and the [illegible] able distortion is occasioned in the road surface. When the frost enters the ground the edges of the road are raised more than the centre, with a resulting convex surface. [illegible] the frost is melting and the water drains out [illegible] an exaggerated camber. The [illegible] damage to a surface [illegible] bituminous matrix, but the more rigid forms of surfacing would be [illegible]

Because of these inherent defects in the V drain, we have for several years been building stone foundations with a flat [illegible] clay or silty material which would work up into the voids of the stone foundation. We first place over the a bed of sandy gravel (when such material can be obtained, varying in the [illegible] may require—in some places 6 in., in others 12 in.—and over this stone fragments not exceeding 8 in. in their largest diameter. The depth of this stone foundation is never less than [illegible] on the edges; under extreme conditions we have used 18 in. in the centre and [illegible] No attempt is made to place these stones as a paving, though some care is taken to lay the bottom stones on their broadest face to ensure a substantial bearing. This, I am aware, is contrary to the theory that a stone laid flat will tilt and cause trouble, and that the usual practice is to place telford stone on edge; but, without discussing the matter further at this time, I can assure you we have built many miles in this manner without trouble. Small stones are thrown on top to close the surface crevices, and the whole is then rolled with a steam roller until hard and firm. This thorough rolling we believe to be one reason for freedom from trouble due to tilting stone. If a bituminised surface is to be placed on the road the voids of the sub-base are filled with clean, sharp [illegible] This is rolled without wetting, and any surplus that remains on top of the base is swept off. This sand filling, however, is not an essential part of the base, but is used only to prevent the loss of bitumen. Bleeders are used to drain the water from this foundation at [illegible] build these outlets as to avoid future clogging.

Foundations of this description have a fairly uniform frost action, appear to be preferable to the V drain, and have been satisfactory.

CONCRETE FOUNDATIONS.

In a district of wood [illegible] expensive types of surface are to be used a concrete base is accepted as the best practice.

There is some difference of opinion as to whether it is better to build a fairly light base of strong concrete (mix of 1 2 4 in [illegible] or heavier mix 5 or 6 inches, or a leaner mix 1 3 6, 1 4 8 [illegible] smaller proportion of cement. Conditions should decide this. In a mixed soil better results might be obtained by the [illegible] there would be less frost action at the greater depth, and the increased depth of the concrete slab should more than offset the loss in tensile strength of the material.

Of course, if it is planned to build a concrete road surface with the ultimate idea of surfacing it at some later time with bitumen or other material, there is no room for argument as to the use of a rich mixture, as it is then necessary so to mix your concrete that it will withstand the abrasion of the traffic. If the bituminous surface is to be only a light one, it is still advisable to use the rich mixture, as the shock of the passing traffic many cause enough surface disintegration to destroy the bond of the bitumen to the concrete.

Illuminating Engineering Society.—A meeting will be held at the Royal Society of Arts, John-street, Adelphi, London, on Tuesday next, the 16th inst., at 8 p.m., when a discussion on "The Development and Design of Lighting Fixtures in Relation to Architecture and Interior Decorations" will be opened by Mr. F. W. Thorpe.

SWANSEA EXTENSION AND SEWERAGE SCHEMES.

Major C. E. Norton last week held an inquiry on behalf of the Local Government Board into applications by the corporation of Swansea to extend the borough boundaries, and to carry out a new scheme of main sewerage with an outfall off the Mumbles Head into the Bristol Channel, at a cost of about £350,000. Major Norton was assisted by Mr. Fryer, inspector of the Board of Trade.

It was stated by Mr. Honorata Lloyd, [illegible] report appearing in the *South Wales Daily News*), who appeared on behalf of the corporation, that the sewerage scheme was considered to be absolutely necessary in the interests of public health. Everyone, he said, agreed that the present state of affairs was one that could not be tolerated, and must be remedied. Counsel proceeded to describe the present scheme, and to compare it with that which was rejected by Parliament in 1912. By means of a cartoon he described the districts it was proposed to deal with, and showed how it was proposed to bring the drainage of an area computed eventually to have 250,000 inhabitants along the Mumbles road to an outfall in the Bristol Channel at the Mumbles Head. He said he would show that the people concerned had not only considered it, but looked on it with favour.

Mr. Midgley Taylor, of Westminster, consulting engineer to the corporation, then gave evidence in support of the scheme. He said that Swansea was one of the finest points of discharge for crude sewage so long as a proper outlet could be got. It was, indeed, infinitely superior to any single outfall at any other resort on the South Coast, including such places as Bournemouth and Brighton. The true tide of the Bristol Channel swept round the Mumbles Head, and the sewage was going to be discharged into the true tide, which was the finest discharge one could have. The tide flowed longer westerly than easterly, which was a distinct advantage to Swansea, enabling the saving of money in the size of the storage tank. He had not, he said, arrived at his present recommendations without exhausting every other conceivable scheme.

Mr. Taylor dealt with the various areas outside the borough it was proposed to drain, showing that the bulk are at present undrained. In regard to the storage and discharge, he had tried in every way to meet every legitimate fear of the inhabitants of the Mumbles and those interested in the oyster fishery, and consequently he had provided for the storage of the sewage in chambers excavated in the solid rock during such hours as it was not advisable to send it into the tide. He had made generous allowances to meet the susceptibilities of the most fastidious—quite beyond what was necessary—and he was confident that the people in the districts affected would be infinitely better off than now.

Cross-examined by Mr. Balfour Browne, witness said he proposed to discharge for four hours and close for eight and a-half hours.

In the course of the proceedings Mr. Morley Samson, who appeared for the Gower Rural District Council, stated that the parties he represented had arranged terms with the corporation, who had given an undertaking that if the proposed sewerage scheme proved unsatisfactory or a nuisance, it would carry out such further necessary works as the Local Government Board might direct.

The inspector said if the Local Government Board considered the proposed outfall would in any way be a risk to the oysters the interests of the district council would be amply protected.

Stockport Water Supply.—The new covered service reservoir of the Stockport Corporation at Alderley Edge was inspected by the Waterworks Committee recently, and afterwards the chairman (Alderman A. Johnson) opened the inlet valves and allowed the water to flow into the reservoir. This reservoir, which has been designed by the water engineer, Mr. T. Molyneux, who has also superintended the carrying out of the work, is the last of the constructional work necessary to utilise fully the Kinder reservoir. Its purpose is to supply the southern portion of the Stockport water area, which includes the districts of Alderley Edge, Wilmslow, Styal and Handforth, and it has been so arranged as to avoid all pumping. The water flows by gravitation into the new reservoir along a pipe line 10½ miles in length, and the work has taken two years to carry out.

Institution of Municipal and County Engineers.

MEETING IN METROPOLITAN DISTRICT.

An animated discussion followed the reading by Mr. H. D. Searles-Wood, F.R.I.B.A., of a paper on "Building By-laws and a Court of Appeal" at last Friday's meeting of the Institution of Municipal and County Engineers. The meeting was held in the institution offices, 92 Victoria-street, Westminster, the chair being occupied by the president, Mr. J. S. Pickering (Cheltenham), and those present including Messrs. W. N. Blair (St. Pancras), J. S. Brodie (Blackpool), Chas. Brownridge (Birkenhead), O. Cattlin (Holborn), A. E. Collins (Norwich), A. P. I. Cotterell (Westminster), W. H. A. Court (Leicester), H. Cubitt (London), R. E. David (Llantrisant), W. R. Davidge (Lewisham), A. Dryland (Surrey), W. Fairley (Westminster), C. F. Gettings (Worcester), S. S. Gettings (Tring), A. Gladwell (Eton), H. S. Graves (Chelsea), W. H. Grieves (Sutton), O. Hilton (Houn-low), Chas. J. Jenkin (Finchley), J. H. Jevons (Hertford), G. Kershaw (Islington), P. G. Killick (Finsbury), H. J. Marten (London), E. B. B. Newton (Paddington), Frank Roberts (Worthing), Norman Scorgie (Hackney), T. Reader Smith (Kettering), W. Stubbs (Blackburn), R. J. Thomas (Buckinghamshire), S. G. Turner (Richmond), H. T. Wakelam (Middlesex), J. A. Webb (Hendon), F. Wilkinson (Wimbledon), E. Willis (Chiswick), and O. E. Winter (Hampstead), members; and W. Douglas (Southampton), O. C. Hills (London), H. D. Searles-Wood (London), H. Shepherd (London), and H. J. Tingle (London), visitors; and the consultant secretary and secretary. Apologies for non-attendance were read from Messrs. H. Percy Boulnois (Westminster), A. D. Greatorex (West Bromwich), and T. W. A. Hayward (Battersea). The paper on "By-laws and the Housing Question," presented at Hinckley on October 3rd last [see The Surveyor, October 16th], also came under the consideration of the members.

BUILDING BY-LAWS AND A COURT OF APPEAL.

By H. D. Searles Wood, F.R.I.B.A.

The resolution that was passed at the Royal Sanitary Institute Congress in 1913 was: "That the council of the Royal Sanitary Institute be requested to urge on the Local Government Board the desirability of the establishment by the board of a tribunal of appeal from the decisions of local authorities on points relating to practices in the working of the building by-laws, and, should they consider that Parliamentary sanction is necessary for the formation of such a tribunal, to take steps to obtain such sanction."

I have been asked to read a paper on this tribunal of appeal, and I gladly avail myself of the opportunity, as I think that there is in some minds a misapprehension of the purpose for which this tribunal is to be appointed. The suggestion was that, in the event of a difference of opinion arising between the authority and the building owner as to the suitability of his design and the construction of the by-laws, the building owner should forward his drawings to the Local Government Board, with a statement of the argument he put forward why the local authority should pass them, and the local authority should state their reason for objecting; the decision of the Local Government Board should be binding on all parties, and there should be no reason why the matter should not be dealt with promptly and with little trouble. I am aware that the Local Government Board always decline to give a legal interpretation, as that is a matter that the courts must settle, but this reference that I suggest would in most cases be as to the reasonableness of the objections, and would not necessarily involve the legal construction of the by-laws, but simply the usual reading of it, with which the Local Government Board would be familiar.

It appears to me that such a tribunal would be more impartial than any local court, and, being a technical body, the decisions would carry more weight, and in course of time these decisions would form a series of precedents which would be of great assistance to both local authorities and building owners.

There has been a tribunal of appeal in the London Building Acts for many years, and it is constituted in the 1894 Act as follows: "One member shall be appointed by a Secretary of State. One member shall be appointed by the council of the Royal Institute of British Architects. One member shall be appointed by the council of the Surveyors' Institution. No member or officer of the council (*i.e.*, London County Council) shall be a member of the tribunal of appeal. Members of the tribunal of appeal shall be appointed for a term of five years, and any such member shall be eligible for reappointment. It shall be lawful for the Lord Chancellor, if he think fit, to remove for inability or misbehaviour, or other good and sufficient cause, any member of the tribunal of appeal.

"Upon the occurrence of any vacancy on the tribunal of appeal, or during the temporary absence through illness or other unavoidable cause of any member thereof, a Secretary of State, the council of the Royal Institute of British Architects, or the Council of the Surveyors' Institution (as the case may be), whichever of them shall have appointed the member of the tribunal whose place shall be vacated, shall appoint forthwith a fit person to be a member (either temporary or permanent) of the tribunal, in lieu of the member whose place is vacated, or who is temporarily absent as aforesaid.

"Each member of the tribunal of appeal shall be entitled to such remuneration, either by way of annual salary or by way of fees, or partly in one way and partly in the other, as a Secretary of State may from time to time fix.

"It shall be lawful for the tribunal of appeal to appoint such clerks, officers and servants as they may find necessary, who shall be paid such salaries as shall be determined by the council, and to provide offices and to obtain such professional advice and assistance as they may find necessary.

"It shall be lawful for the council (*i.e.*, London County Council) to defray the expenses of supporting any decision of the council or of the superintending architect, or of their engineer, or of a district surveyor by counsel and witnesses before the tribunal.

"It shall be lawful for the tribunal at any time to state, and the tribunal shall, if ordered by the High Court, or a judge thereof, on an application in a summary manner of the High Court on any question of law involved in any appeal submitted to them. The High Court shall hear and determine the question or questions of law arising on any case stated by the tribunal of appeal, and shall thereupon reverse, affirm, or amend the determination (if any) in respect of which the case has been stated, or remit the matter to the tribunal of appeal with the opinion of the Court on the case stated, or may make such other order in relation to the matter as the circumstances of the case require, and may make such order as to the costs of the case and in the High Court as to the Court may seem fit.

"The tribunal of appeal shall, subject to the provisions of this Act, have jurisdiction and power to hear and determine appeals referred to them under this Act.

"For all the purposes of and incidental to the hearing and determinations of any appeal, the tribunal shall, subject to any rules of procedure duly made, have power to hear the council (London County Council) and the parties interested either in person or by counsel, solicitor, or agent, as they may think fit, and to require the production of any documents or books, and to confirm, or reverse, or vary any decision, and make any such order as they may think fit, and the costs of any of the parties to the appeal, including the council, shall be in the discretion of the tribunal.

"The tribunal of appeal may, from time to time, subject to the approval of the Lord Chancellor, make regulations consistent with the provisions of this Act as to the procedure to be followed in cases of appeal to the tribunal, including the time and notice of appeal, and as to fees to be paid by appellants and other parties.

"Any order of the tribunal of appeal may be enforced by the High Court as if it had been an order of that Court.

"All fees and sums of money paid to the tribunal of appeal shall be paid over to the council and carried to the county fund, and the salaries or fees payable to members of the tribunal, and the other and establishment expenses of the tribunal, and ex-

[illegible] to be [illegible] and the [illegible] to [illegible] to be determined out of the [illegible] mind.

I have set out these reasons in full so as to give some idea of the way the tribunal of appeal under the London Building Acts is constituted. I do not suggest that it should be a precedent for the tribunal of appeal for the Model By-laws, but it has been found to work well in London.

One of the points for discussion might well be as to the way in which the tribunal should be constituted.

With regard to the arguments in favour of such a tribunal, it seems to me, judging by many of the suggestions that are made in papers on the amendment of the by-laws, that there is a wrong impression of the principle upon which by-laws are founded. We are a free people, and there is a common law right for every man to build as he likes on his own land.

The very interesting *Liber Albus* of the City of London, a collection made during the [illegible] of Sir Richard Whittington of documents [illegible] ancient, contains FitzAlwyne's "Assize of Buildings," written in 1189. It has the following [illegible] obstruction of the view from windows: "If any person shall have windows looking upon his neighbour's land, although he may have been a long time in possession of the view to such windows," it is said, nevertheless his neighbour may lawfully obstruct the view from such windows by building opposite the same, or by placing anything there on his own lands in such manner as may be [illegible] most expedient, unless the person who has such windows can show any writing by reason whereof his neighbour may not obstruct the view from those windows." This shows that the right to build as the owner liked existed in those days.

The by-laws are only concerned with the safety of the public, and not of the owner. This is shown by the exempt building clauses, which to some extent are wider in the Metropolitan Building Acts than in the Model By-laws. Before 1875 the by-laws only regarded the safety of the public from two standpoints—that is, fire and stability. After the Public Health Act it was recognised that the sickness of the occupier might be a menace to the public, and the sanitary aspect was added to the other two. The Amended Rural By-laws, recently issued, which were based largely on suggestions made by the Royal Institute of British Architects, clearly show the three points of view of the safety of the public. As I read the suggestions made in the various papers to amend the by-laws, this is not the idea of their authors, but they want to make the building by-laws a complete code of building construction, which is impossible. The Local Government Board have at present before them the London County Council By-laws for Reinforced Concrete Construction, which, when approved, will, I think, be largely used all over the country for reinforced concrete regulations. Anyone who makes a careful study of these rules will at once see that they require very expert knowledge to construe them, and that it would be hopeless to take a dispute as to whether the design objected to was properly designed before the local courts. And it is with this in view that I strongly urge the formation of an expert tribunal that could give an unbiassed opinion that would carry weight in such disputes as are certain to arise. I am quite ready to admit that the knowledge of the stresses and strain in buildings has improved very much of late years, and the ability to calculate these reactions is possessed by a great many officials; but as this form of construction is rapidly coming more and more to the front, and ingenious forms of its application are constantly being designed, it is difficult for those officials who have so many other duties besides building surveying, to keep abreast with the times. Experience in the carrying out of this form of construction is very essential to the appreciation of new forms of design.

Some people are of the opinion that the time has come when there should be a general Building Act for the whole country. Let us hope if this comes to pass that it may be so drawn as not to stereotype existing methods of construction, but stimulate new and better methods than at present. It might be a good thing to encourage architects to work out the strains and stresses in their structures by making a law that the methods of calculating the designs should be submitted to the district surveyor, and if found correct the construction should be allowed. [illegible] and [illegible] with all these [illegible] and [illegible] to [illegible] party [illegible]

The rules laid down in the Metropolitan Building Act of 1854 for dealing with the rights of the building and adjoining owners of a party wall have worked so well that it is surprising no other city or town has adopted the same system, which is briefly as follows:

When a building [illegible] party wall is to be rebuilt, the building owner serves on the adjoining owner of the party wall notices, which describe the work that is to be done to the party walls, and in this notice the building owner appoints a surveyor to represent him. If the adjoining owner does not agree within fourteen days of the service of the notice, a difference is said to have arisen, and the adjoining owner appoints a surveyor to represent his interest, and these two surveyors meet and appoint a third surveyor.

The first two surveyors then examine the party structure and draw up an award, in which is set out the work that has to be done, and when this [illegible] and the matter is settled. Should the two surveyors [illegible] to agree [illegible] the third surveyor is called in, and within seven days he has to appoint a day for a hearing, and the three surveyors [illegible] which, when signed by the two, is published and becomes a binding document, only to be upset on appeal before a magistrate. The position of the third surveyor is not quite that of an arbitrator; he is only equal in rank to the other two surveyors; but it has been found to work well, and many awards are made by means of the third surveyor which could not be made between the two surveyors in the first instance.

The third surveyor, being quite impartial, can complete the award which one of the interested surveyors would not care to sign. This method of dealing with a difficult situation is really a great help to architecture, and some such system should be part of the statute law. At present the law on the subject is that the party structure is common with the two parties, the building and the adjoining owner; it cannot be touched without the assent of both parties, and there is no means of compelling this consent. It is in this respect that the London practice has such great advantages.

The term "party wall," though often used merely with the signification of a wall separating adjacent buildings, means in its general sense and is properly applicable to any wall which parts or divides adjoining lands, whether built upon or not, held by different owners with regard to ownership and rights of user. The term may be used in four different senses. It may mean:

(1) A wall of which the adjoining owners are tenants in common.

(2) A wall divided longitudinally into two strips, one belonging to each of the neighbouring owners.

(3) A wall which belongs entirely to one of the adjoining owners, but is subject to an easement or right in the other to have it maintained as a dividing wall between the two tenements.

(4) A wall divided longitudinally into two moieties, each moiety being subject to a cross easement in favour of the owner of the other moiety.

But the most ordinary and primary meaning of the term is a wall of which two adjoining owners are tenants in common.

The common user of a wall separating adjoining lands belonging to different owners is *primâ facie* evidence that the wall and the land on which it stands belong to the owners of the adjoining lands in equal moieties as tenants in common; and when a wall has been erected at the joint expense of adjoining owners, and held and used by them in common, it seems clear that, in the absence of evidence to the contrary, a jury would be directed to find that the wall and the land on which it stands are held by the two owners as tenants in common. In the first case the defects of the law as it stands are that nothing can be done to the wall without the consent of the adjoining owner, and there is no power to compel him to give his consent. If the wall be out of repair and one owner repair it, he cannot compel the other owner to contribute. In the second case, where the wall is divided into two strips, either strip can be removed without the consent of the owner of the other strip, and without regard to the efficiency as a party wall of the other portion;

but there may be a right to lateral support. The right of one house to lateral support from an adjoining house generally has its origin in two or more houses having been built by the same owner at the same time. The right of lateral support may also be derived from an express grant, or it may be claimed by prescription.

When a wall is a party wall in the third sense—a wall which belongs entirely to one of the adjoining owners but is subject to an easement or right in the other to have it maintained as a dividing wall—or where a wall is a party wall in the fourth sense—viz., a wall divided longitudinally into two moieties, each moiety being subject to a cross easement—the owner of the servient tenement is not, unless the duty is cast upon him by express stipulation, bound to repair; the easement being for the benefit of the owner of the dominant tenement, it is for him to do the necessary repairs, and it is considered that he will have the right to enter upon the servient tenement for that purpose. But in the fourth case, if either party took down his own moiety he would be liable to an action in respect of any damage which might thereby result to his neighbour.

When one of two adjoining owners builds a house so that one of its external walls stands upon the ground of his neighbour, the owner so building will in due time acquire a title to such wall under the Statute of Limitations, for possession of the house is possession of the wall, which is but a part of the house; but in such a case the owner of the land can at any time before the statutory period has elapsed bring ejectment and recover possession of such site with the wall thereon; but when a man erects a building against his neighbour's wall, utilising it for the purpose of support, and has a covering for one side of such building, he will not by lapse of time obtain a statutory title to the wall, for it does not form part of the building so erected, but is merely an abuttal thereof, and cannot be considered as in his exclusive occupation or possession. But he would, after the lapse of twenty years, become entitled at least to an easement of support from his neighbour's wall for his roof and other analogous rights. A wall may be in part of its length a party wall, and in part of its length an external wall, and there is no distinction between height and length, and the wall may be a party wall up to part of its height, and may be an external wall for the rest of its height.

DISCUSSION.

Mr. E. Willis (Chiswick) proposed a vote of thanks to Mr. Searles-Wood for his paper. He thought a similar compliment had already been paid to Mr. Court. Mr. Searles-Wood was not a municipal engineer, and he was sure they all appreciated members of the allied profession coming to their meetings and giving them the benefit of their experiences. There was one point he would like to mention. He was not aware that the law was such that where a man put up a wall that abutted on his neighbour's wall he acquired a prescriptive right to support after twenty years. He never realised that, although they all studied the law of easements to a certain extent. They had a barrister present among them that evening, and he should like to hear him on that, because it was not fair or reasonable that that should be so. A large part of the paper was simply a description of the London Building Acts, so far as the tribunal of appeal. This was extremely useful for London, but he was not sure that it was quite so useful for the country, where the circumstances were so totally different. In the country they had not got the county councils as the supreme authority, and he was not so sure that they wanted them. He appreciated the county councils and their engineers, and the work they did, but he doubted whether they wanted to throw any more work on them, and to have a tribunal of appeal in the way suggested or outlined by Mr. Searles-Wood. His experience, both in London and the provinces, was probably great; but the problem was—Ought they to have discretionary powers in by-laws? And they must settle that point before they got on to the question of tribunals. The old *Liber Albus* mentioned by Mr. Searles-Wood was extremely interesting, but he noticed there was an entire absence of any mention of the rights of light in the clause he had quoted. The author had said that the by-laws were only concerned with the safety of the public, and not of the owner. He was glad of that, but he thought they very largely covered the safety of the occupier. It was that that the district councils had to consider, and they did occasionally come across youthful architects who were not so brilliant in their qualities as the reader of the paper, and sometimes he had had to have the stresses of girders and columns increased. They would have been absolutely unsafe if he had allowed them to be put in in the form proposed, and the reputation of the architect would have been impaired. He had actually been thanked for pointing out slips of that kind. So he thought they had the safety of the occupier in their hands when examining plans. Then Mr. Searles-Wood had mentioned some of the points with regard to reinforced concrete. He agreed that the time had come when they must have some by-laws, but he thought it was better to sit on the fence until they received the thorough discussion they were receiving in connection with the London by-laws. He did not agree with Mr. Searles-Wood in his statement that it was impossible to make the building by-laws a complete code of building construction; he (Mr. Willis) thought the by-laws should be a complete code. Then there was the suggestion for a general Building Act for the whole country. That would be useful, but he did not think they could get over the fact that what was suitable for one district was not suitable for another—and that was the object of the Local Government Board in revising by-laws for each district. Therefore, if they had a general Building Act for the whole country, there would have to be special regulations governing many of the districts. There was just the question as to the constitution of the proposed tribunal. The first point was to settle whether it was desirable, but he would not discuss that. The constitution of the London authority was very excellent, and its work admirable, and if ever it was considered to be desirable, something on those lines might meet the difficulty. In substance, he thought he was in sympathy with Mr. Court in not cutting down working-class dwellings too much in the matters of the height of ceilings; he would rather increase the sanitary facilities of the cheaper description of houses, and not economise at the expense of health.

Mr. A. E. Collins (Norwich) remarked that Mr. Searles-Wood's paper, with its suggestion of a Court of Appeal on by-laws, was very interesting to anyone who knew what the difficulties were. One wanted to be reasonable, and sometimes they had got to stop things which they regarded as reasonable, because the by-laws had to be administered. He was afraid it was impossible to have by-laws and not carry them out when they thought they ought not to be carried out. If there were a properly constituted Court of Appeal they would be able to insist upon an actual compliance with the by-laws, knowing that they were not inflicting hardship upon anyone, because if the building owner thought the surveyor's construction of the meaning of the by-law was wrong he would have a Court of Appeal to decide the matter. He could not agree with Mr. Searles-Wood as to his proposed tribunal. The county councils throughout the country would be the worst possible Court of Appeal. In the country the county councils had nothing to do with buildings, and it appeared to him the Courts of Appeal should consist of selected persons in the area. In England there might be sixty Courts of Appeal, each dealing with a certain area. He thought the general line of the tribunal of appeal for London would be the sort of thing they wanted for the country generally. The leading men in the parties [illegible] in the paper for London would be elected by the local authorities to form the court. With regard to the by-laws, these would have to vary with the character of the district and the building. That was to say, if they were building a house that stood by itself, with no risk of fire, the by-laws for the construction of walls might be very different to a house built in close proximity to other houses. He thought the latest by-laws of the Local Government Board provided for that kind of thing. There was a different code for rural districts other than that for urban districts. He did not see why one code should not apply to all districts, with different clauses to suit the requirements of each district. The aim of the local authorities should not be to make building impossible by adding largely to the cost of building. The sanitation and the stability of the building should be completely provided for; but with regard to by-laws to prevent the spread of fire, they should depend upon the locality. With regard to the reinforced concrete by-laws, he thought the code the London County Council were working out was the best to adopt, but whether local authorities would adopt such a complicated [illegible] was another matter. They were now

getting [illegible] that the tribunal of appeal in London. Both Mr. Willis and Mr. Collins had spoken as to the tribunal of appeal [illegible] do with the construction of buildings. The right of appeal was as to any powers they had as to the prescribed distance from the centre of the road, any buildings proposed to be erected beyond the general line of buildings and the certificate of the superintending architect as regarded what was the general line of that building, and the certificate of the engineer as to whether the land should be built on or not if it came within the definition of low-lying land. The building by-laws were dealt with by the district surveyors of the several districts, and the London County Council and the tribunal of appeal had nothing whatever to do with that building. If the district surveyor made any requirement upon a building owner, and that building owner did not choose to comply with that request, then the proper course would be for the district surveyor to serve a notice of irregularity, and if the owner did not comply with that then it was the business of the district surveyor to take him before a stipendiary magistrate and not the county council at all. It was not made very clear in the paper, but those of them who had to deal with the tribunal of appeal rightly understood that its province was limited, and it was only such actions [illegible] council or the building owner might be the aggrieved party, that were taken to the tribunal of appeal as the independent authority. While dealing with that tribunal of appeal might he make a remark on Mr. Searles-Wood's statement that "the rules laid down in the Metropolitan Building Act of 1854 for dealing with the rights of the building and adjoining owners [illegible] prising no other city or town has adopted the same system," and, further on in this paper, "that some such system should be part of the statute law"? He should like to ask was 1854 a misprint for 1894?

Mr. Searles-Wood: No, sir; this is the first Building Act—a private Act, not a statute.

Mr. Scorgie said he agreed that the whole of the Building Acts were consolidated by the London Building Act of 1894, and the laws were statute laws, and these dealt with party structures. If there was [illegible] party [illegible] a notice on the adjoining owner. He had a case in which he had to serve notice, as his foundation was going lower, and had to describe the work he was going to carry out.

Mr. Searles-Wood: It only applies to the Metropolis. It is a private Act, and not a statute law.

Mr. J. S. Brodie (Blackpool): It applies to a district.

Mr. Scorgie said it applied to the Metropolis. He agreed with Mr. Willis as regarded the discretionary power in by-laws. He thought that would be a very unwise thing. They knew very well that this country was at present locally governed in small areas, and those of them who had had experience in those small areas knew what influences would be brought to bear upon officials if any discretionary power was given under the by-laws. If they could say "those are the by-laws," they could require them to be carried out, and everything went on smoothly; but if there was power was given, even to the council, they knew what wheels there were within wheels in small areas. He felt it would not conduce to the better government of this country, or better sanitation, or more healthy dwellings, or the health of the people. Regarding reinforced-concrete structures, he, like Mr. Collins, hoped something would be done soon. The Local Government Board had had these present rules of the county council under consideration for some time, but even when they did come back he doubted whether they would conduce to building in reinforced concrete, for he had the authority of architects with experience of these rules for saying that if the rules as forwarded by the London County Council to the Local Government Board were adopted, it would be cheaper for persons to build with brick or stone than with [illegible] be effected under the Metropolitan rules.

Mr. W. R. Davidge (Lewisham) said that as a district surveyor in London he would like to serve Mr. Scorgie with a notice of irregularity with regard to one or two of his remarks. The tribunal of appeal in London has very considerable powers as regarded the construction of buildings. These were not often used, but nevertheless they had the powers, and, as they knew, district surveyors in London were the persons who, in the first instance, prescribed what buildings should be; but, apart from that, the tribunal of appeal have full power. It said much for the architects of London that that power was very rarely used. But the fact that there was that provision was a reason why the law was wisely administered. He thought the paper hardly conveyed what was at the back of Mr. Searles-Wood's mind. But the remarks of Mr. Willis and Mr. Collins had brought out of that proposal something that was more workable for the whole country. As he read the proposal of the author, it was simply a tribunal that would interpret the by-laws, and as he understood Mr. Willis and Mr. Collins, it was to twist that proposal round, so that that tribunal would have some power of revising and altering the by-laws in par[illegible] ward by them, that of Mr. Collins was the more important. If they had power to alter or revise in a particular case, it must not in fairness be left to the local authority; it could only be workable if left to some independent tribunal, as suggested by Mr. Searles-Wood, and very much improved by Mr. Collins' remarks. Something of the kind was workable; but to leave it to the discretion of the smaller authorities was unthinkable and impossible in working. The great distinction and the principle he thought they ought to keep in view was to discuss the possibility of varying the by-laws in any particular case, and the best means of bringing that about. It was, he thought, agreed that the local authority ought to have definite rules to work on, but these should be relaxed to meet the circumstances of certain districts. On the Continent and in the Colonies it was customary to divide the districts up into zones, instead of having a cast-iron system of by-laws. A tribunal was undoubtedly what they ought to aim at. The point that ensures the smooth working of the London Building Act was the presence of this tribunal of appeal. The tribunal was talked about very much, but did very little work, for the number of cases in twelve months could be counted easily on the fingers of one hand—two or three cases was well within the average. When they considered that the number of buildings and alterations dealt with by the district surveyors every year was somewhere about 40,000, they would, he thought, see the great advantages of having the tribunal. [Mr. Scorgie: How many of those 40,000 would it be possible to take to the tribunal of appeal?] He thought it fair to say that the powers of the tribunal were limited, but not so limited as Mr. Scorgie suggested in his original remarks. But the discretionary powers Mr. Scorgie regarded as better vested in the tribunal, and not the county council, which, after all, outside London was not the building authority. They had in London practically a composite system. The county council were the court of appeal, and could allow modifications, and the tribunal of appeal to whom the public could appeal in the case of what they considered unjust treatment by the London County Council, or the district surveyors. They realised that London was different, and the Building Act of 1189, mentioned by Mr. Searles-Wood, was, after all, only one of a long series of Acts which had led steadily down 1,725 years. It might [illegible] provisions in the by-laws—such as that dealing with parapet walls through roofs—dated back to 1707, in the time of Queen Anne, when the only provision for dealing with fires was the village squirt, and it was time these provisions were overhauled. Another provision related to the setting back of window frames and reveals. They could learn a lot from the London practice, and also what to avoid, and he thought that meeting would do well to confine its discussion to the ideal set out by the author, and especially the ideal elaborated by Mr. Collins. If it was possible to vary by-laws, they were all agreed there were many cases in which they should like to see that done, but he did not see how they could allow small authorities the power of discretion. Something in the nature of a tribunal was, he felt sure, the eventual outcome they ought to aim at—not a tribunal to in-

terpret by-laws, but a tribunal to alter by-laws to suit particular cases.

Mr. T. READER SMITH (Kettering) said that, as a country member, he should like to have some tribunal to which disputes as to the interpretation of by-laws could be referred, but he should be sorry to see that body the county council. Members of county councils were mainly country gentlemen with no interest in or knowledge of building. They did not always get on with these councillors as smoothly as they might, and they would not like to have this further bone of contention introduced. He thought they would prefer the Local Government Board. With reference to Mr. Court's paper, he had been making visits to housing schemes, and it might be interesting to state that all those he had seen had been carried out under the ordinary by-laws, and no one thought they had been badly hit by them. He should be sorry to see the height of rooms reduced, or walls of less than 9 in. between himself and the weather; he should personally prefer it to be 11 in., with a 2-in. space between the bricks.

Mr. C. J. JENKIN (Finchley) stated, in regard to the question of discretionary by-laws, that at a meeting of the Town Planning Institute a short time ago it was unanimously agreed that, although in some cases these discretionary powers were advisable, it was fatal to put that power in the hands of local authorities. By the very virtue of their constitution they were not suitable to be a tribunal in their own district. There were cases in which it was very difficult to know what to do, especially in by-laws which were ambiguous. One could not build properly without good by-laws, and he had never seen one code which was good from beginning to end. On the question of discretionary powers he had heard many builders say that they would rather go into certain districts where the surveyors understood the by-laws, and carried them out, than they would build in districts where the by-laws were interpreted by the officials. He knew that every official tried to be fair, but he knew of cases of glaring unfairness, where the official had decided in one way in one case and differently in another. For that very reason the doubt that existed in people's minds would prevent building taking place in certain districts. If they had a tribunal in the hands of some impartial body like the Local Government Board it would be very helpful and useful, but to give discretionary powers to local authorities was highly undesirable.

Mr. S. G. TURNER (Richmond) said he was unable to appreciate the subtle distinction to be drawn between a private Act of Parliament and a statute. A private Act and a public Act were equally statutes, and a by-law, although not a statute, if properly made and confirmed, had just as much force as a statute. It was just as well, in discussing by-laws, that that point should be borne in mind. There was this distinction, however, between a by-law and an Act of the Legislature: No one could question the power of Parliament to pass any Act it liked; but in the case of a by-law, if it were not within the powers given by the statute under which it was made, it could be declared void by the courts. With regard to by-laws, three kinds of questions might arise: First, as to the validity of the by-law itself — that was a question of law; second, as to the interpretation of the by-law—that again was a question of law; third, as to whether, in any given case, the requirements of the by-law should be dispensed with. The questions which went before the tribunal of appeal in London were either questions relating to the building line or to the construction of public buildings, in regard to which there were no by-laws or statutory provisions, the matter being within the discretion of the district surveyor. Only if there were no by-laws, or if the by-laws could be dispensed with, would there be any work for the proposed by-laws appeal court to do. He doubted whether a discretionary dispensing power would be advantageous to the municipal engineer. It would cast a great responsibility upon him. It occurred to him also that there would be a considerable addition to the responsibilities of local authorities if they had powers to dispense with the by-laws; but there was room for some independent tribunal to which some power of dispensation might be given. With regard to by-laws and housing, one speaker had said that in most cases local authorities conformed with their by-laws. It was a more remarkable fact, however, that some authorities had not done so, thus acting quite illegally. Local authorities had no more power to dispense with the by-laws than the private builder. He was not at all sure that the very difficult question of dispensation could not be solved on lines something like those suggested that night by creating an independent tribunal covering a large area, to which, in exceptional cases, some kind of appeal might be made.

Mr. J. S. BRODIE (Blackpool) said throughout the discussion he had been much surprised to find a kind of tacit consent among members that there was no such thing as a tribunal of appeal outside London; but, seeing that he had on two separate occasions been hauled up before such a tribunal, he knew that it existed. In the course of his career he had twice appeared in a Court of Quarter Sessions to show good and just cause for the reason that was in him for saying that he could not allow the authority to pass the plans. In both cases, after a lengthy hearing and all manner of hard swearing, he was pleased to say that that Court of Appeal gave a decision in his favour, and he was very grateful to them. That much for existing practice. Further, he would like to say, with regard to a point Mr. Turner had touched upon, as to local authorities having to observe their own by-laws, he dared say everyone present knew that the public authorities, when they were allowed, were the worst sinners in the breaking of by-laws—worse even than the most disreputable of owners. He, on one occasion, advised his people they could not do what they were going to do unless they broke the by-laws, and he told them he would not be a party to breaking the by-laws. They put the case before the Local Government Board, and got a dispensation from the board to set aside the by-law. That was a distinct case of their own. Now, with regard to the discretion, all he could say was that those who were advisers of local authorities knew that quite enough discretion was taken without giving the authority. If they began giving them something no one knew where it would end. He would give no discretion at all, but would lay down a hard-and-fast rule; so far as he knew, no public authority could do anything of the kind. He heard the remarks of Mr. Searles-Wood with regard to party walls with the greatest pleasure. After all the question of party walls largely depended upon the conveyance of the land, and the landowner, if he was wise, put in his covenant a provision that cleared up the question of party walls for once and all. The law seemed very uncertain as to what they could do, but if the selling owner put it in his covenant how it was to be dealt with, then there was no further difficulty in the matter. There was the general question as to what by-laws were made for. He always thought by-laws were made, first of all, for the protection of the occupier, and he very frequently needed protection from certain builders; then there was the protection of the general public, and, of course, protection of the neighbours of the house in question. They had these three classes of persons to consider. They had to see that the occupier had not the roof falling about his ears; they had to see that the public did not get their heads cracked; and they had to see that the house did not fall upon the neighbour and kill him. These were all reasonable things. The general law of England was that a man must so carry on his business—whether it was building houses or anything else—so as not to be an injury to his neighbours. In regard to the complete code of building construction, he hoped they might be preserved from anything of that kind; that would be one of the greatest mistakes they could make. It would shut out all enterprise, make everything to a stereotyped pattern, and they would be in the position of the unhappy Germans if they attempted anything of the kind.

Mr. H. T. WAKELAM (Middlesex), speaking for representatives of county councils, said they were the last people who desired to have anything to do with building by-laws. He had had something to do with the construction of by-laws, and he knew the difficulties they had to contend with. It was not always a pleasant thing to construe them, and the manner in which the builders desired to construe was one with which he could rarely agree. He could assure them that the county councils did not want to be the authority for by-laws. In his work at Middlesex there were 600 buildings they had to license for stage plays, dancing and music. The condition he always made was that they should bring him the certificate of the local authority, and let them know that their by-laws were complied with, because if they were according to the by-laws Mr. Willis had to administer he was satisfied that they were in

[illegible]. With regard to the construction of the [illegible] he thought the Local Government Board were on the right lines. One speaker said that did not have many appeals to make, either to the [illegible] the courts, [illegible] the appeal authority, which he supposed he [illegible] would not have many appeals made to them. With regard to reinforced concrete buildings he thought something should be done with the class of building which was springing up on all sides in Middlesex. This should be done if it was only to satisfy the public that they [illegible]. At present the public were not satisfied and [illegible] of these buildings were [illegible]. Personally, he thought some regulation should be framed by the Local Government Board and experts brought together, and definite lines laid down with regard to these buildings, and the regulations with which they must comply. He was absolutely in agreement with Mr. Brodie that there should be no [illegible] with anything in the byelaws. He knew what the trouble was in regard to buildings. They had in Middlesex standing orders, and there were [illegible] and they were the bane of his life.

Mr. F. Wilkinson (Wembley) said he was [illegible] with a [illegible] and not concrete, with the byelaws. The [illegible] stated that under the Education Act it was necessary to comply with the by-laws if the Board of Education passed it. That was an [illegible] Department breaking the by-laws which they had in force. As regarded reinforced concrete, he thought generally that rules for calculating the stresses ought to be adopted all over the country. If one did adopt rules, and could enforce the architect to give the loads he proposed to carry, one could in a decade without [illegible] were suitable or not. Wimbledon being a residential district, the troubles they had had with architects had been solely with regard to the height of windows and as to what was a two-storied building. He had not experienced much trouble with the first, and had had a great deal with the other. A certain section of architects wanted very low windows indeed, and he did not agree with these at all. As to the tribunal of appeal, he did not think that would be very helpful to surveyors in the country. He agreed that by-laws should be harder even than at present, for when one had to deal with councillors—many of whom were not technical men—one had to press very hard sometimes for by-laws to be carried out. They had been revising their by-laws for some time past. The by-laws now in force were passed in 1881 by the Local Government Board. Recently he had sent to him the new by-laws of another district, and on looking up a certain question which would be very helpful to them, he found that their old by-laws were even more drastic than the new by-laws passed by the Local Government Board for a large town. Consequently they had not very much to improve if these particular by-laws were the most recent and best in the country.

Mr. Searles-Wood, in reply, said he was rather amused to be [illegible] though he was a member of another profession. He was for twenty-five years a district surveyor, a member of their own profession. He would like to point out to Mr. Turner that the Act of 1909 gives a considerable amount of waiving for certain things. They were all constructional points, in regard to steel framings, and the same thing with regard to reinforced concrete. In the skeleton iron framing they could always ascertain the strength of a building, but when the framing was covered with concrete it was very difficult to tell what the strength of the building was. That was why they wanted such careful regulations.

Mr. Corry also briefly thanked the members for the manner in which they had received his paper.

Montreal Water Supply.—The Canadian Bitumastic Enamels Company, Limited, Montreal, the agents for Wailes, Dove & Co.'s "Bitumastic" materials, have secured the contract to clean and apply "Bitumastic" enamel to the interior surfaces of the emergency intake water pipe for the city of Montreal. This pipe is, approximately, 1,400 ft. long by 8 ft. in diameter, and was built to prevent a water famine such as the city experienced in 1913. The American agents for the same materials secured contracts for the city of New York and the city of Baltimore.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

When will "the authorities" make an attempt to standardise the hand signals used by drivers of road vehicles? Would it not be simple, as suggested in the *Royal Automobile Club Journal*, to fix the signals somewhat as follows: (1) A turn to the right—the arm of the driver extended at a rigid right angle; (2) a turn to the left—the arm to wave the overtaking traffic past the driver who is signalling—*i.e.*, a sweep of the arm encouraging the vehicle behind to pass; (3) a stop to be indicated by the driver extending his arm with the forearm bent at the elbow, so that the hand is in a vertical position? Would not these simple signals very soon be acted upon, and thus avoid what is now nothing but confusion?

Will anything come of the recent horseshoe competition and the prizes awarded by the Roads Improvement Association? Or will custom and prejudice, as usual, stand in the way of improvement, and our roads still suffer from the cogs, or calkins, and toe pieces which are so detrimental both to the surface of the road and to the horses themselves?

Is it true, as was remarked by a learned man a short time ago, that the world is without an astronomer at the present moment? Was he correct when he asserted that of "star-gazers" there were plenty, but of discoverers in the great, and almost mystic, science of astronomy there were none? Is it not true of nearly all sciences that observers are required, but that there would be little progress without imagination?

Shall we not all agree with Mr. Oscar Kirby, after reading his excellent paper on "Extraordinary Traffic," set forth in the issue of The Surveyor of the 5th inst., that Parliament should, if possible, define the nature and quantity of traffic to permit of its being converted from "ordinary" to "extraordinary"? If this consummation could be reached, would it not tend to lessen the enormous amount of work which a surveyor now has to go through in order to prepare the necessary evidence and particulars for each case of this kind that comes before the courts? But then, how would solicitors and counsel like such simplicity?

Is not Mr. Norman Scorgie to be congratulated on his excellent presidential address to the Society of Engineers? Does not such an address tend to stimulate the municipal engineer to further exertions to make his work larger and more imperial, and "to make his advice to his council a source of strength and not a string of platitudes"? Would not the profession of the municipal engineer benefit considerably, and be more honoured if we could all take to heart the excellent advice contained in Mr. Scorgie's address?

Is it a fact, as stated in a recent letter to the *Times*, that the military authorities warned the civil authorities of certain East Coast towns some time ago that German air raids might be expected, and suggested that the diminution of light at night was desirable? Is it also true, as stated, that the civil authorities would not listen to this advice? And would it not be interesting to know if the borough surveyors were consulted on the question, and whether they were allowed to express an opinion on the subject?

Is there not a good deal to be said in favour of Mr. Searles-Wood's suggestion that, in case of dispute with regard to interpretation of building by-laws, the Local Government Board should form a court of tribunal whose decisions shall be final and binding? Would not such a tribunal of experts be more satisfactory than a court of summary jurisdiction, or even a law court, where the tribunal may or may not be expert in the law, but knows nothing of technicalities? In addition, would not the time of municipal officers be less frequently taken up in lengthy litigation, and more fully occupied in more useful work?

Town Planning Institute.—At a meeting to be held this (Friday) evening at 92 Victoria-street, Westminster, Mr. F. M. Elgood, F.R.I.B.A., F.S.I., will open a discussion on "The Land Unit." The chair will be taken at 8 o'clock.

THE HIGH-SPEED GAS ENGINE.

By R. Embleton, Manchester.

A paper descriptive of the construction, working and advantages of the high-speed gas engine, and defining the special fields in which its merits are particularly valuable, was read at a meeting of the Junior Institution of Engineers on Monday.

In his opening remarks the author endeavours to show that, as regards regularity of speed, this class of engine is especially suitable for generator driving. This, however, he pointed out, is not the only qualification necessary, for, particularly in central station work, the engine must be absolutely reliable and able to generate its rated power for long periods without breakdown.

The high-speed gas engine is designed to give its rated power with the comparatively low mean pressure of about 70 lb. per square inch and an initial explosion pressure of about 250 lb.—not much higher than that used in a modern steam engine. Consequently it is able to run for long periods without trouble from overheating or undue fatigue of the working parts, and, if necessary, is capable of dealing with overloads up to about 15 per cent for short periods.

These engines are fitted with a forced lubrication system to all working parts, so there is no reason why they should not run continuously with very little attention. As a matter of fact, there are a large number at work running continuously day and night, with only one short stop at the week-end. In case of breakdown—to which any machinery is liable through bad material or workmanship—all parts are easily accessible. Both pistons and valves can be withdrawn through the tops of the cylinders. If a light crane or runway is fitted overhead, and a few spare parts kept in stock, damaged or broken parts can be easily and quickly replaced, and time lost through this cause reduced to a minimum. The parts most liable to wear and breakage being the piston rings, valves, springs and ignition plugs, an assortment is usually supplied by the engine makers, but in any case they are not costly items to replace.

To maintain these engines in operation it is only necessary to keep them supplied with gas. For small powers this can be obtained from the town's supply, and even for the larger powers this source is preferable in districts where gas is supplied at a cheap rate for power purposes, the only accessory then required being a meter to register the quantity used.

Where town's gas is not available, or too expensive, producer gas is used and generated on the premises by means of suction or other gas plants, using anthracite coal, or coke.

In large installations ordinary bituminous coal is used in the Mond or other gas plants.

A supply of gas being available, high-speed gas engines can be started immediately by simply barring the engine to the starting position and then opening the compressed-air starting cock—no previous warming up being required, as in the case of the steam engine. This quick starting is of great value in certain cases.

SOME ADVANTAGES.

For direct coupling to centrifugal pumps for sewerage, drainage, irrigation or dock work, the ease and rapidity with which these engines can be started up is of great advantage, particularly in installations for the prevention of floods, or in sewage works where, on the extent of a storm, downpour of rain, they can be started up immediately to deal with the flood water and relieve the main sewers. Several large pumping plants have been put down for this purpose by the London County Council, consisting of vertical gas engines coupled to centrifugal pumps, and using town's gas, which is always ready on tap, and as their use is only occasional, and for relatively short periods, the cost of gas does not much matter. In this case the starting air is also used for the priming ejectors of the pumps.

The high-speed gas engine can also be used for almost any of the purposes that the slow-speed engine is used for, the only disadvantage being the matter of price, which is rather higher per rated horse power than is the slow-speed type. But even this fact is largely counterbalanced by the smaller space occupied by the engine and by the smaller buildings and foundations required.

To sum up generally, the advantages of the high-speed gas engine and the fields in which it can be fittingly used are as follows: It possesses all the qualifications of reliability, regularity of speed, and economy of running necessary for the driving of electric generators for lighting or power either in private works, large shops, or in central station work for the public authorities of small boroughs, urban or rural districts. No boiler is required, and no unsightly stack to emit black smoke and pollute the atmosphere. The absence of vibration enables it to be installed in towns or cities without damage to surrounding property, or in urban or rural districts without annoyance to the inhabitants, while it can be installed in neat and artistic buildings in keeping with the style of the districts. It is compact and neat in appearance, and, as it can be direct coupled to the generator, only a small floor space is required with buildings comparatively small for the power generated. Where town's gas is used, it is self-contained, and, with the exception of the starting apparatus and circulating pump, no auxiliaries are required, and the whole plant can be housed in one building. Where a gas plant is used, this can be covered by a cheap lean-to shed on one side of the engine-house. A very little coal goes a long way, an occasional feed with a bucket being all that is required—no laborious stoking, and no constant stream of coal carts that are a necessary adjunct in connection with some steam plants.

The consumption of town's gas is about 20 cub. ft. per b.h.p. hour of gas of a value of 500 B.T.U. per cubic foot, and, with gas at 1s. 8d. per 1,000, works out to ·4d. per b.h.p. hour, or ·6d. per Board of Trade unit. In some towns gas is very much cheaper than this, with a corresponding reduction in fuel cost. Where a gas plant is used, about 1 lb. of anthracite coal per b.h.p. hour is required, this amount covering stand-by losses during short periods when the engine is not working. With anthracite at 30s. a ton, this works out to ·16d. per b.h.p. hour, or ·24d. per unit. In some parts of the country anthracite can be obtained at a very much less figure than 30s.

All the foregoing figures are taken on a full-load basis; with an average of three-quarter load they would be increased by about 10 per cent.

COSTS.

The question of running costs as compared with steam sets depends, of course, to a great extent upon the size of plant, type of engine and boilers—ancient or modern—and the price of coal, which varies considerably in different districts. The first installation of high-speed gas engines with which the author was connected—installed about twelve years ago—is still running, and, he believes, giving satisfaction—will permit a fair comparison being made between the cost of gas and steam sets.

The engines in question were two 4-cylinder gas-electric sets of 180-kw. capacity each, served by two gas plants, and were installed in a station alongside of an existing steam station of exactly the same capacity, consisting of two 180-kw. triple-expansion steam sets with water-tube boilers and superheaters and mechanical stokers.

The total annual cost of the complete coal steam plant was £3,642, and the total annual cost of each set of gas plant was £3,200, a difference in favour of the gas plant of £442. In the steam station, with coal at 18s. 6d. per ton, the total works cost was ·875d. per unit generated. In the gas station, with coal at 18s. 6d. per ton, the total works cost was ·552d. per unit generated. Both sets worked with a load factor of 65 per cent. It will be seen that a difference in favour of the gas set of ·323d. per unit under practical working conditions was obtained in this particular instance with [illegible] plant as compared with coal-fired steam plant of the latest design.

Whitewashing Footpaths.—At the last meeting of the Urban District Council D. Randall moved that consideration should be given to the advisability of whitening street kerbing. Such a proceeding would, he thought, lessen the dangers at present existing, and be of particular advantage to strangers. If all the kerbing could not be done he would suggest that it be done for 25 ft. at each corner. It would help to prevent people stumbling over the kerbs. The matter was referred to the Works Committee, the surveyor in the meantime to bring up a report. The Chairman suggested that if people would walk on the footpaths and not on the roads it would be a great help.

Law Notes.

EDITED BY J. B. REGINIER CONDER, 57 Moorgate Street, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only, should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address. Correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction (i.e., without re-drawing or amendment). *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion queriers are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

CONNECTION OF DRAINS WITH SEWER—REGULATIONS.—"Rural" writes: Can the rural district council, to be bound by the following Regulation, which is one of a series of Regulations made by my council under the Public Health Act, 1875 (s. 21), be legally charged? "2. Any owner or occupier of premises within the above district who intends or is required to empty his drains into the sewers of the council shall give to the surveyor to the council at least fourteen days' previous written notice of his intention to commence the work, and such notice must be delivered in duplicate, with a plan of the case for the surveyor's superintendence, and on a form, copies of which may be obtained on application at the office of the surveyor to the council, between the hours of 10 a.m. and 12 o'clock noon. Every such notice and deposit thereof must be accompanied (1) by a ground plan in duplicate, showing (a) the premises proposed to be drained, drawn to a scale of 1 in. to every 8 ft., (b) the direction of the lines of the proposed drainage, (c) the sizes and construction of the proposed drains, (d) the course of all the surface and underground drains upon the premises; and (2) by a section, in duplicate, drawn to the same scale and showing (a) the proposed drains; (b) the gradients thereof. One copy of such plans and sections will be retained by and become the property of the council.

The section gives an owner or occupier a primâ facie absolute right to cause his drains to empty into the sewers on two conditions only, viz.: (1) Giving such notice as may be required by the local authority of his intention to do so, and (2) complying with the regulations of the authority as to the mode of doing the work. [illegible] subject to the control of some person who may be appointed by the authority to superintend the making of such communications. The regulations are at the entire discretion of the local authority, but they must relate to the matters mentioned in Bambley's Public Health Acts, 8th edition, p. 78). Obviously the above alleged "regulation" does not relate to the matters mentioned in the sections. It cannot therefore be regarded as one of the regulations referred to in the section, but merely as a statement of what kind of notice is required by the authority. There appears to be nothing in the section to authorise the demand of a fee with the notice, and in any opinion payment thereof could not be enforced.

FLOODING OF HIGHWAY.—"J. K. D." writes: A [illegible] has a hedge which during heavy rains [illegible] owing to the water not being able to find its way [illegible] at the gateway. [illegible] rather to the fact that the drains are not large enough to carry the water. I should be obliged if you would inform me whether my council has power to enforce the owners of the land to lay larger pipes or build larger stone drains, taking into consideration that the existing ones are in good condition. It will be necessary, when fresh drains are laid, to lower the watercourse.

It is the duty of the owner of lands adjoining a highway to cleanse and scour his own ditches to such an extent as to prevent nuisances or obstruction to passengers. Accordingly, in *Attorney-General v. Waring* (63 J.P., 789) an injunction was granted against a landowner to restrain him from causing a nuisance and obstruction to a highway by neglecting to cleanse his ditch, and so causing the highway to be flooded from time to time. Where a landowner, for his own purposes, pipes part of his ditch as at a gateway entrance), it would seem reasonable to infer that the pipes must be sufficiently large to prevent a nuisance or obstruction. I can find no authority, however, on this point, which must therefore be considered as doubtful.

CLASSIFICATION OF ROADS: FORM No. 2.—"G. E." writes: In the above form Question 12 is as follows: "Office and establishment expenses of the council (approximately), including surveyor's department—(a) chargeable to district highways and bridges account; (b) chargeable to main road account. (This item applies only to those councils which maintain main roads under sec. II (2) of the Local Government Act, 1888, and to those with whom the county council have contracted to maintain main roads.)" The [illegible] is expressed that under [illegible] the urban district council ought to charge to the main road account a portion of the surveyor's salary, clerk's salary, and of the office and establishment expenses. Will you please say whether the opinion is correct or not? And if so, what power has the council to make such charges? It may be stated that there is no contract between the county council and this council respecting the maintenance of the main roads in this district. The whole of the main roads in this district are maintained by this council, the whole of the expenditure on main roads being charged to the main road account, the county council making a contribution towards the cost.

The difficulty of the form evidently is that [illegible] the establishment charges, including surveyor's department, should be included under paragraph (b), and I think the opinion referred to in the query is correct. The council have power under sec. 2 of the Highways Act, 1878, to raise money for the repair of highways, and this includes everything ancillary to the carrying out of that object. See Pratt and Mackenzie's "Law of Highways," 15th edition, p. 170.

PRIVATE FOOTPATH LAMPS.—"W. I. H." writes: We [illegible] a private proposal to erect a lamp on a public footpath passing through privately owned land. I should be much obliged if you would kindly give me information on the following points: (1) Have the council power to light such footway? (2) Can the owner of the land object to the erection of a lamp, [illegible] any statement be claimed by him?

(1) In my opinion they have. Under sec. 161 of the Public Health Act, 1875, an urban authority may contract with any person for the supply of means for lighting the "streets" in their district, and may provide such lamps, lamp-posts, and other materials as they may think necessary for lighting the same. The expression "street" as used in the Act includes [illegible] any footway, whether a thoroughfare or not. (2) The owner cannot object, or claim compensation. The council have a discretion where to erect lamp-posts, and their discretion will not be interfered with at the suit of adjoining owners, even though [illegible] consequence of such lamps obstructing the access [illegible] premises [illegible] Ch. [illegible].

[illegible] EXPIRE THE HOUSING ACT NOT [illegible]. "J. A. I." writes: "Will you please give me your opinion if a notice served after an inspection under the Housing, Town Planning Act, 1909, is legal, seeing the officer was allowed to make an inspection without having had to serve the twenty-four hours' notice under the Act?

In my opinion a notice to execute works under subsec. (3) of sec. 15 of this Act is not invalid by reason of an inspection having taken place without notice. Under subsec. (3), "if it appears" to the authority that the undertaking implied by subsec. (1) is not complied with, they are bound, if a Closing Order is not made, to give a notice to execute works. An officer cannot inspect until after twenty-four hours' notice if the occupier chooses to stand on his rights. But if the occupier likes to allow inspection without notice, this does not, in my opinion, prevent the authority from acting upon the information so obtained.

DRAINS BY FLOODING.—"L. C." writes: Many thanks for your answer to my query *re* flooding by [illegible]. Do you not think that the fact that the hatch being left open constitutes negligence on [illegible] as he was quite aware that [illegible] would take place as it had happened before?

This is rather a difficult point. I do not think the owner was bound to construct the overflow drain, and if not the question is, Did he, by leaving the hatch open, cause a greater amount of flooding than would have occurred from natural causes before the construction of the drain? If not, I think it is doubtful whether he would be held liable.

HOUSING AND TOWN PLANNING ACT, 1909: PRE 1909 TENANCIES.—"Medical Officer of Health" writes: Is it a fact that, under sec. 14 of the Housing and Town Planning Act, 1909, a rural district council is unable to enforce owners to provide remedies for defects under 15 (3)?

No. In a rural sanitary district the rural sanitary authority is the local authority within the meaning of Part II. of the Housing of the Working Classes Act, 1890, and can therefore proceed under sec. 15 (3) of the Act of 1909.

PRESENTATION TO MR. THOMAS COLE.

The high esteem and affection in which the late secretary of the Institution of Municipal and County Engineers, Mr. Thomas Cole, Assoc.M.Inst.C.E., is held by the members of that body was once more demonstrated on Friday evening last, when at the commencement of the meeting which is reported on another page of this issue he was presented with a cheque for £40 and a gold watch and chain, a bracelet watch for Miss Cole, his daughter, being at the same time handed to him.

In making the presentation, the president, Mr. J. S. Pickering, said it was something like forty-two years ago that there was formed the Association of Municipal and Sanitary Engineers and Surveyors—a body which had advanced in numbers and influence year by year, until at the present time, under a somewhat more dignified title, it had become an institution comprising upwards of 1,700 members. One of the main reasons why the institution had made such progress was that it had been fortunate enough to have as its secretary one who had placed his devotion in the interests of the institution before every other consideration. When Mr. Cole became secretary some thirty-three years ago there were only 200 members, so that he had seen the membership increase eight times. During his long career as their official he had, of course, seen many changes. Many of his old friends had passed away, and there now remained very few of those who were connected with the society when he first took up office. But while the inexorable hand of death had removed many members whose memory they all greatly cherished, time had brought forth a host of new members whose esteem for their late secretary was no less sincere. He (the president) had learnt, as others had done, to regard him, not merely as an official, but as a friend in the highest sense of the word. During his long career he had had the entire confidence of each succeeding council, and he was sure it could be said that he had the esteem of every single member of the institution. That evening it was his privilege to ask Mr. Cole to accept from them a gift in token of their esteem, and with their good wishes for his future welfare and happiness. He hoped that the watch would ever be a reminder to him, and to generations to follow him, that time could not eradicate the good he had done for that institution, and that the chain might symbolise the bond of affection in which he was held by its members. The cheque for £40 was the balance of a limited subscription which had been contributed to by no fewer than 800 members of the institution. The bracelet watch was presented to Miss Cole with a hope that she might wear it as a token of their affection for her father and with sincere wishes that Mr. Cole and those near and dear to him might have a future of unalloyed happiness.

Mr. Cole, who was greeted with cheers on rising to respond, said the kind words the president had addressed to him, and the enthusiastic way all present had endorsed by their applause the latter's most kind and generous speech, filled his heart with such emotion as to make it really almost impossible, certainly very difficult, for him to find words adequate to express his heart's deep gratitude, not only to those present, but to that great concourse of his friends who had presented him with that exquisite memento of their kindly esteem, and for their very generous appreciation of his life's work and service to their beloved institution. Let him at least say that the president's words and the applause of that gathering were an indescribable joy to him, and that, however long he might be spared to live, the proud happiness of that evening, engendered by their appreciation, would brighten the rest of his days, as he felt that this expression of their esteem was not a farewell, but was the treasured testimony of hundreds of dear and valued friends. It was interesting to note that at the date of his joining the institution the number on the roll of membership was about 200. The number on their list now totalled 1,750. He had hoped, within his secretaryship, to see the numbers touch 2,000, but in view of their limited field, and having regard to the strict censorship that was exercised over applications for membership, the present numbers must be considered very satisfactory, especially so when it was remembered that this growth of membership was commensurate with the improvement in the status of the municipal engineer. He had been privileged to see no fewer than thirty-three presidents occupy the honoured chair of the institution, and each one of these had most unselfishly laboured to advance the honour and the prestige of the institution. On a previous occasion he referred with justifiable pride to the past-presidents who had gone before, and whose good work must ever adorn the roll and afford a tradition that would for all time enrich and ennoble the history of their institution. And of those living he might be allowed to mention at least one, Mr. J. A. Brodie, of Liverpool, who was chosen by the Government as the leading authority of the kingdom to advise and assist in the lay-out of the new city of Delhi. He was proud, and justly proud, that his connection with the institution had brought him into contact with such worthy men. There was just one other point he wanted to place on record on quitting his office—that was that the institution was quite well known in the great State departments of the country. Besides the Local Government Board there was the Foreign Office, the Colonial Office, and the Board of Trade. There was the India Office, the War Office, and last, but not least, the Road Board, whose advisory council consisted entirely of members of the institution.

INSTITUTION'S HISTORY AND WORK.

With their permission he wanted to take a rapid glance at the history of the institution. This might be divided under two heads: (1) History Proper—consisting of those changes in the constitution of the institution which had generally contributed to its development, its expansion, and its present important dimensions. (2) The Work of the Institution. Now, with regard to the first section, it must be remembered that when originally constituted the rules of the Association of Municipal and Sanitary Engineers and Surveyors, by which name they were then known, only admitted chief surveyors to authorities under the control of the Local Government Board, which meant England and Wales only. Although this principle was very strongly held and fought for, the party of progress ultimately prevailed, and they accordingly found the rules had become enlarged so as to take in not only the municipal engineers of Scotland and Ireland as well as the Metropolitan surveyors, but the municipal engineers of our Colonial Empire. Next they found that new classes were formed which enabled deputy and chief assistants to be brought in, and finally the aim and object now was to proffer the advantages and benefits of the institution to the whole staff of the municipal engineer. He had intended to take that opportunity of glancing at the events of interest in the history of the institution, but as they had something else to do than to listen to him he would confine the remarks he had to make as to the work of the institution to one or two items only.

SECURITY OF TENURE.

The first was as to protection or security of tenure. Some critics had gone so far as to think or say that nothing had been done in that direction; but, although perhaps little or nothing had been actually achieved, he would point out that the records showed that the institution was actually conceived in the endeavour to obtain protection, and no fewer than three Presidents of the Local Government Board had been petitioned and interviewed. At the initiation of the institution, Mr. Lewis Angell, with the early pioneers, petitioned and interviewed Mr. Stansfeld, the then President of the Local Government Board. Then in 1884 Mr. Angell and Mr. Ellice Clark, in able addresses, presented the case again very forcibly to Sir Charles Dilke, who, as President of the Board, took the chair at their meeting at the Healtheries Exhibition, and, lastly, a deputation of the council interviewed Mr. Burns in 1914. In 1872 Mr. Stansfeld admitted his astonishment at the facts submitted, but opposed the practical experience of the deputation by an academic view that the principles of local self-government, improved sanitary laws, greater public interest in sanitary progress, the spread of education, and an improved constitution of local authorities would in the end accomplish all that the petitioners desired. In 1884 Sir Charles Dilke in his speech, after referring to the case of the Poor-law Officers, sympathetically spoke of the suggestion made at the meeting that there should be something between Government control and purely local control. By changing the county government to the local government system it might be possible to introduce an appeal from one small elective body to another larger authority covering the same area.

The Surveyor
And Municipal and County Engineer.

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That would not have [illegible] object on to which a central London contribution [illegible] and "I have always thought," said Sir Charles, "that it would be possible to give a great number of powers on appeal against the action of small local authorities to a duly representative county authority which might be a proper court of appeal for such purposes." Last year, 1914, Mr. Burns warned his deputation that in seeking protection surveyors to local authorities might possibly be building up for themselves an authority that would cramp their [illegible] and place them in a position with much less liberty than they at present enjoyed. At all events there was brought to Mr. Burns a great mass of evidence of cases of hardship which the institution had collected, and they still went on hoping that some remedy would be found and adequate protection given to surveyors in carrying out the Public Health and other Acts which their really difficult position required. Besides that there was a very great deal of work quietly done by the council and its committees of which little was published or generally known, and which he could only just refer to. For instance, there was standardisation of all kinds—arterial roads, sanitary work, road technique, and questions such as the arbitration clause in contracts, corrugation of tramway rails, and many other matters. Lastly, he would refer to the financial position of the institution, which he regarded as most satisfactory from one item alone, and that was the small amount of arrears of subscriptions. That, he assured them, compared very favourably indeed with other societies, and manifested a very healthy interest by the members in the welfare and progress of the institution.

THANKS TO STAFF.

He must not, and would not, leave his subject without referring to the loyal assistance that had always been given to him by his staff. It was a pleasant duty publicly to tender to Mr. Giles his warmest acknowledgment of his faithful work and most useful assistance in his twenty years' service to the institution. He was only too well aware that much that he had credit for was due to him, and, as much that he did was unseen, he assured them that the institution had much to thank Mr. Giles for in the keen interest he took in all that pertained to the business of the institution. He sincerely trusted the institution might long have his services and his valued assistance. He should like to say that he heartily congratulated the council on their choice of his successor. In Mr. Robinson they had a most able and courteous gentleman, and one who was in every way fitted for the office which he now filled. Mr. Robinson had been most unfortunate, through the exigencies of the troublous times, in losing from the very outset the services and the assistance of Mr. Giles, and had thus been left alone to carry on the complicated work of the office. Mr. Robinson had, he knew, had a hard and anxious time, but he also knew that his ability, coupled with great courtesy, had enabled him to pull through a very difficult time. It was, indeed, he was sure—that the institution and the council would give him that warm sympathy they had always shown himself. Mr. Robinson was there with them that evening. He would see in that delightful function his predecessor's long services crowned with a host of precious friendships, while at the same time he would have the testimony of the institution's most generous treatment of long and loyal service.

FUTURE OF THE INSTITUTION.

Let him say, in conclusion, that he had always had the greatest pride and confidence in their institution. He had the strongest belief that there was a great future before it—that it was one of the most useful and valuable bodies that existed in this country, inasmuch as it had done a great work in improving the status of the municipal engineer, and thereby materially assisted in effecting the diminution of the death-rate of the country. In this alone it had rendered incalculable service to the public weal. Now he gave up his life-work, and, as they might suppose, he gave it up with a bit of a pang. He had done his best well and truly to serve the council and the institution, who had treated him in a most generous spirit—first, by pension, and then, as a special honour, by electing him consultant secretary and honorary secretary with a seat on the council, and for that very exceptional recognition he was and should be always most profoundly grateful. For all the kind things the president had said of him, or so much of them as he was entitled to, he was most sincerely thankful, and he could only hope that he might yet be spared awhile to assist in the useful work that lay ahead, the accomplishment of which should maintain the institution in the forefront of the technical societies of the kingdom. It was difficult for him to find words to express his earnest thanks and his gratefulness for the beautiful gifts they had presented him with that day. It was certainly a most delightful idea to associate his daughter with him in that charming presentation. She would, he well knew, treasure all her life that very beautiful memento, and on her behalf he tendered them her most sincere and heartfelt thanks and deepest gratitude. He could only say, "Thank you; thank you from the bottom of my heart," and that for the rest of his days he would look upon these gifts as the very precious testimony of their kind and most generous appreciation of his life's work.

Sanitation in the Hexham Rural District.—The county medical officer's report on sanitary matters came before the meeting of the Hexham Rural District Council. With regard to sewerage and sewage disposal, it was stated that, although many improvements had been effected in recent years, the rural district council were under many obligations which had not hitherto been met. The much-discussed schemes for North and South Wylam, Corbridge, Acomb and Allendale were still "on paper" only, and unless some early and definite steps were taken in the direction of fulfilling the council's obligations at these places, more drastic measures under the Rivers Pollution Acts would be necessary.

London County Council School Buildings.—Under a scheme initiated by the London County Council in agreement with the Board of Education for the reduction of the maximum accommodation of classrooms to forty in senior and forty-eight in infants' departments, it is proposed to provide sufficient new school accommodation to allow of the reduction of the accommodation of all classrooms to the new maxima within fifteen years from March 31, 1912. During this period the council propose to provide about 24,000 school places in each triennium, and to proceed with the modernising of the structures of old council schools. It is estimated that it will be necessary to provide during the fifteen years' period about 120,000 school places, inclusive of the accommodation required to meet increases of population and for other purposes. The total expenditure involved in the purchase of sites, the erection of new buildings, and the improvement of the structures of existing buildings, is estimated at £5,150,000. The progress made up to December, 1913, in the initiation of school provision in connection with the scheme is shown in the annual report of the council dealing with education, just published [price 2s. 6d.].

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

456. Strength of Materials. A rectangular beam is loaded by a weight at its centre. How will the deflection be changed by (*a*) doubling the span, (*b*) doubling the width, (*c*) doubling the depth, (*d*) doubling the load?

457. Hydraulics. A common formula for the mean velocity of flow in streams and artificial channels is $v = c\sqrt{mi}$. Explain carefully the meanings of the various factors on the right-hand side of the expression, and state how the values of *c* for various kinds of channels have been determined.

458. Fireproof Construction.—Give sketches of some good forms of fire-resisting floor construction for a warehouse.

459. Sewage Sprinkler.—Describe an efficient form of sewage sprinkler for percolating filters which requires very little head of sewage to work it. (J. R. H., *Ipswich.*)

460. Sewage Sea Outfall.—Are reinforced-concrete pipes better than cast-iron pipes for a sewage outfall into the sea, which is covered at high water? Compare them as regards initial expense and maintenance. (J. R. H., *Ipswich.*)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

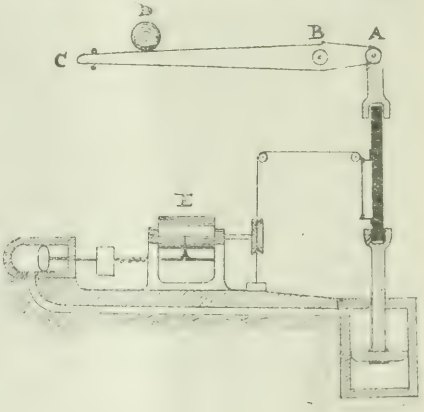
454. Foundations.—What should be the composition of concrete for the foundations of a factory chimney stack? Would lime concrete be suitable? (Ajax.)

The nature of the foundation for a chimney depends on the stability of the chimney site. Generally speaking, the foundation should be composed of Portland cement concrete in the proportion of 4 parts of stone (broken to pass a 2-in. ring, and retained on a ½-in. ring), 2 parts of clean sharp pit sand, and 1 part of Portland cement of standard quality. In cases where bad ground is met with the concrete should be reinforced, and, if necessary, placed on a raft. If the ground is exceptionally bad, reinforced-concrete piles should be driven, and the concrete foundation laid on top of and bonded into them. Lime concrete is very inferior to Portland cement concrete for work of this class. (J. R. H., *Ipswich.*)

For the construction of the foundation for a factory chimney, it would not be advisable to use lime concrete. In the event of lime being used, it should be hydraulic—such as blue lias lime—and should be allowed to set at least two months before the superstructure is commenced. For this class of work cement concrete is far superior, and after being allowed to set for two weeks the building could be safely started. The composition of the cement concrete should be 5 of broken brick or stone, and 1 of fine gravel to 1 of cement. It should be laid in beds not more than 18 in. in thickness, and care should be taken in tipping it into the trenches. If the trench be deep, a shoot should be used so as to prevent disintegration of the mixture. (F. J. M., *Luton.*)

455. Testing Materials.—Give an outline sketch of a testing machine for tension tests of steel. (Inquirer.)

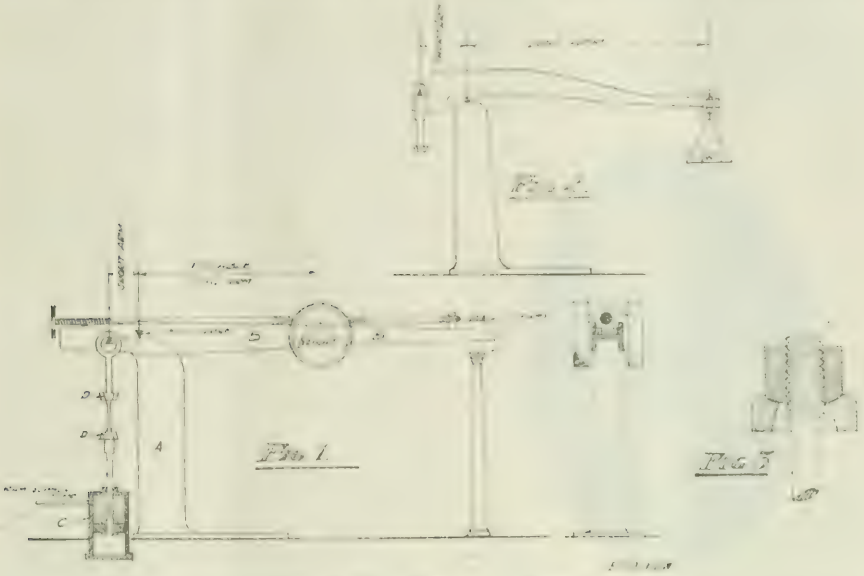
The tenacity of a metal is the [illegible] it offers to the separation of its molecules by force. The tenacity of various metals varies considerably according to their physical properties, but in all cases the tensile strength becomes reduced by a rise in temperature. The tensile strength of metals is determined on a straight bar 1 in. square, the strength being expressed per square inch according to the number of tons or pounds required to produce a rupture of the test bar. When the test bar is submitted to a tensile test, it is increased in length proportional to the weight applied until a certain limit is reached; then the strain increases very rapidly, and a permanent distortion is produced. The point at which this extra strain commences is known as the "elastic limit" of the metal, which is "the greatest strain that does not produce a permanent set in the material." If this limit is exceeded the structure rapidly fails. A machine for testing metals is shown in sketch. It is made with two pairs of jaws in which the test bar is held. One pair are connected with a hydraulic cylinder,



and the other pair with a lever carrying a weight, by which the stress exerted by the ram is measured. A simple lever carries a balance which measures the load, the pressure being applied by hydraulic ram. The ratio of AB to BC is 50 to 1, so that at C it balances 50 tons at A, the weight being 1 ton. E is a revolving drum worked by a wire attached to the test bar. The pencil is worked by pressure in hydraulic press, and has an axial motion proportional to stress, by which a stress diagram is obtained. The safe working load for mild steel is 6 tons per square inch in compression and tension, and the ultimate strength is 30 tons per square inch in compression and tension. (Sanitas.)

The chief features of any machine for efficiently testing the tensile strength of steel are: (1) That the machine should be sufficiently sensitive to record tests that will be more severe than the actual stress the material will have to withstand; (2) the method of applying the load must be as easy as possible, and no undue shocks must be given at each increase of load. In the earlier machines (Fig. 2) a long fixed arm formed the lever, and the stress was applied by variable loads (W) at its extreme end. This method was both laborious and inaccurate, as shocks were given at each increase of load. Fig. 1 shows an outline of the essential parts of a 50-ton Buckton testing machine. A is a rigid casting securely bolted to the foundations, and carrying the principal knife-edge or fulcrum of the lever B, to which is attached the jockey-weight. At the base of the standard is a hydraulic press (C) fed by a hydraulic ram, which takes up the deformation of the specimen, which is held between the shackles DD (details of which are shown by Fig. 3). The object of the press (C) is to take up the elongation

of the bar, thus keeping the lever in balance that is floating freely between the stops which limit its motion. The pocket weight is exactly 1 ton, and can be moved along either by hand or by rotating A vernier is attached to the pocket weight, which is set at zero on a scale running along the lever. The pocket weight is moved along the lever and sets 1 ton to the load for every 3 in. of movement, and the vernier reads on the scale to 1/100 ton, the press meanwhile keeping the lever horizontal. The Admiralty tests for steel tensile and extension tests are strips cut lengthwise or cross-



50-ton Buckton Testing Machine.

wise on the plate to give an ultimate tensile strength of not less than 26 tons per square inch, 30 tons per square inch of section with an elongation of 20 per cent in a length of 8 in. (E. J. M.)

WORKING-CLASS ACCOMMODATION IN LONDON.

With a view to the county council being kept informed as to the provision of working-class accommodation in London and the adjoining districts, a return is prepared each year showing the amount of new accommodation provided and old accommodation destroyed. The return which has been prepared for the years 1902 to 1912 inclusive, gives the number of working-class tenements and rooms provided in each borough or district, and the rents at which they are let or to be let, in addition to particulars of the demolitions which have taken place in each district during the year. The return for 1912, it is noted in Part III. of the annual report of the county council for 1913, shows that, for the first time since this record was taken, there has been a nett reduction for the year in the amount of working-class accommodation in the county, the number of rooms demolished (6,790) having exceeded the number provided (4,167) by 2,623. In extra-London—i.e., the area known as Greater London exclusive of the county of London—the number of rooms provided was 13,141, and the number demolished 807, or a nett addition of 12,334.

The average weekly rents at which the new dwellings were let, or to be let, were, during 1912, 3s. 5½d. a room in the central districts of London, 2s. 7d. in the outer districts of London, and 2s. 4½d. in the extra-London districts.

Institution of Mechanical Engineers.—The annual general meeting of this body will be held on Friday next, the 19th inst., when a paper on "Convertible Combustion Engines" will be read by Mr. Alan E. L. Chorlton, member. The chair will be taken at 8 o'clock.

LONDON MAIN DRAINAGE.

WORK AT BARKING AND CROSSNESS OUTFALLS.

Volume III. of the annual report of the London County Council has just been issued, and includes some interesting particulars with regard to the main drainage of the administrative county.

A table in the report shows the quantity of sewage treated, chemicals used in precipitation,

Sewage treated, 58,306,918,286 gallons and 45,733,395,400 gallons—a total of 104,040,313,686 gallons.

Sewage daily average, 159,744,981 gallons and [illegible] gallons.

Lime used, 13,343 tons and 9,775 tons—total, 23,118 tons.

Proto-sulphate of iron used, 3,075 tons and 2,794 tons total, 5,869 tons.

Sludge sent to sea, 1,683,000 tons and 946,000 tons—total, 2,629,000 tons.

[illegible] 32,400 tons and 18,192 tons—total 50,558 tons.

Refuse intercepted at gratings, 3,938 tons and 1,450 tons—total, 5,388 tons.

From the above figures it will be seen that at Barking outfall 1 ton of sludge was extracted from an average of 34,645 gallons of sewage treated—or slightly less than in the previous year. At Crossness outfall the average quantity of sewage treated to produce 1 ton of sludge was 48,344 gallons, which is also less than in the preceding year. The total quantity of sewage treated is shown as about 7·4 per cent less than in the preceding year. The quantity of sludge sent to sea was 1·4 per cent more than in 1912.

Nottingham Port Scheme.—Although there was slight opposition, the Nottingham Corporation have decided to proceed with the Bill for improving the Trent navigation and making Nottingham an inland port. The estimated cost of the scheme is £160,000.

London County Council Tramways Bill.—The London County Council Tramways and Improvements Bill came before the Examiners of Standing Order Proofs at the House of Commons recently, and was stopped, owing to representation of non-compliance with standing orders. The Bill will, therefore, have to come before the Standing Orders Committee, which, unless it sees fit to suspend the standing orders will have to reject it this Session.

NOTTS COUNTY SURVEYOR.

COUNTRY OR COUNTY?

Mr. E. Purnell Hooley, M.INST.C.E., the county surveyor of Notts, whose resignation of that office after twenty-five years' service (*i.e.*, the whole period during which Notts has possessed either a county council or a county surveyor) we had to chronicle recently, was for many years an officer in the reserve forces, holding a commission as Captain in the Robin Hood Rifles.

Upon the outbreak of the present war it was almost a foregone conclusion among those who know him intimately that his high sense of patriotic duty and keen military ardour would impel him to offer his services to his country, and it was not long before we found him gazetted Captain in the Sherwood Foresters—otherwise the 8th Battalion of the Nottinghamshire and Derbyshire Regiment. Here his

CAPTAIN QUARTERMASTER HOOLEY.

well-known organising ability was quickly recognised, and he undertook the onerous duties of Captain Quartermaster to the battalion. By the fortunate circumstance that the battalion's headquarters and training centre are in the vicinity of Nottingham he has, with the loyal aid and ever-ready co-operation of his staff, been enabled to continue to perform his official duties. The training of the battalion is, however, approaching completion, and it is under orders to proceed to a more distant station preparatory to going to the Front.

In this contingency, and with the desire that, upon Captain Hooley's return to civil life, the council should continue to have the advantage of his unique experience, a suggestion was made that the work of his department should, for the time being, be entrusted to the present staff, outside advice being called in when deemed necessary—or, alternatively, that a *locum tenens* should be appointed; but, with an inconsistency that is not a little surprising, prominent members of the council who at recruiting meetings had been especially conspicuous in exhorting men to make great sacrifices in their country's cause seemed in this instance to act upon the view that the officials of the council were on a plane that precluded them from responding to their country's call, the convenience of the council being of even more moment than the nation's vital need.

In passing we can hardly refrain from observing that when men elected to high positions in the public service act in this way it is not to be wondered at that the Government find it necessary to advertise special appeals to employers to give facilities to their employees to enlist.

As a result Mr. Hooley tendered his resignation, personal considerations and advantages being evidently in his view altogether outweighed by his obligations to his country; at the same time he acknowledged that he was deeply sensible of the kindly feelings evinced towards him and so warmly expressed by the chairman of the Highways Committee, Colonel Denison, C.B., under whom he has served for very many years, and by Mr. Chas. Mason, J.P., who will be remembered by many of our readers as the surveyor to the late Metropolitan Vestry of St. Martin-in-the-Fields.

What will be the county of Nottingham's loss will certainly be a gain to the country.

At the moment our sincere hope is that good fortune may attend Mr. Hooley throughout the period of his military service, and that he will retire therefrom in the enjoyment of the best of health, with the lustre of new honours to add to those he has so deservedly gained in his profession. We believe that upon his return to civil life he purposes establishing himself at Westminster as a consulting engineer, when his pre-eminent expert experience and high reputation in the special branch of the profession he adorns should certainly ensure him success. He has our most cordial wishes.

Captain Hooley's eldest son, George, is also a Captain in the Sherwood Foresters. He was trained as a pupil and assistant to his father, but (as is recalled by the *Nottingham Guardian*) as a result of the visit of the latter to the American Good Roads Congress held at Seattle in 1909—at which Mr. Hooley's presence and paper on "Tar and its Uses in Road Construction" were prominent features—some of the leading spirits in the "Good Roads" movement in the United States induced Mr. George Hooley to make his home in that country, so that it might reap practical benefit from the employment of methods propounded by Mr. Purnell Hooley, and the experience gained by his son in being associated with him in this work.

After some five years' service in the States Mr. Geo. Hooley recently returned to this country, and, inheriting the martial spirit of his father, at the outbreak of the war at once offered himself for active service.

Another member of Mr. Hooley's family—his brother-in-law, Dr. Stallard, ex-mayor of Newark—is medical officer of the same battalion, while another brother-in-law is Major Sidney Stallard, the county surveyor of Oxfordshire, who, it will be remembered, served in the South African Campaign, gaining special distinction by fighting a successful rearguard action against De Wet—a unique experience at that time—for which he was very warmly eulogised in a special article by the late Mr. Bennet Burleigh, the well-known war correspondent of the *Daily Telegraph*. Major Stallard served as an officer in the 17th County of London Battalion, of which Mr. W. B. Bryan, M.INST.C.E., chief engineer to the Metropolitan Water Board—whose death we had occasion to lament recently—was Colonel.

It came with something of a shock to us, when reading the report of the meeting of the Notts County Council at which the arrangements following upon Mr. Hooley's resignation were decided upon, not to find any mention of the granting of a suitable retiring allowance to one whose able and untiring service as their county surveyor for a quarter of a century surely deserves substantial recognition. We therefore trust we are not mistaken in believing that in due course this question will be dealt with in a just and even generous spirit, such, for instance, as actuated the London County Council in granting Sir Laurence Gomme, their clerk, a retiring allowance of £1,000 per annum, with, in addition, a douceur of £3,346.

ROTHERHAM BOROUGH SURVEYORSHIP.

THE SUCCESSFUL CANDIDATE.

Mr. W. Shackleton, ASSOC.M.INST.C.E., borough surveyor of Nelson, was on Wednesday appointed borough surveyor of Rotherham, in succession to Mr. E. B. Martin, M.INST.C.E., the new borough engineer of Salford.

Athlone Waterworks. The Local Government Board have refused sanction to a loan of £4,000 asked by the Athlone Urban District Council to extend and improve the waterworks plant in view of an increased demand for supplies. Recently the military authorities became customers of the council, and will take annually 7,000,000 gallons of water.

Novel Wood Curing. A French process of "electro-curing" timber is stated to give perfect seasoning in a single night, and at little cost. With lead-plate electrodes on each side, the timber is placed in a solution containing 10 per cent of borax, 5 per cent of resin, and a little soda; application of the current expels the sap and fills the wood cells with the borax and resin.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible

INQUIRIES HELD.

Leeds T.C. (February 5th. Mr. R. G. Hetherington). £1,600 for the provision of a pumping station for sewage at Shadwell.—The station is required in order to deal with the sewage of a portion of Shadwell, which lies outside the watershed of the river Aire, and the proposal is to run a rising main from the pumping station to the crest of the hill, whence the sewage will be gravitated into the Leeds sewers. This proposal marks the completion of the scheme of sewerage for Shadwell. The inspector afterwards held an inquiry into a further application of the corporation for sanction to borrow the sum of £1,200 for the provision of a new boiler-house at the Cookridge-street baths, and for sanction to borrow the sums of £100 and £150 respectively for the erection of a dressing-room for children in connection with the Kirkstall-road and Dewsbury-road baths.—The case on behalf of the corporation was submitted by Mr. Thomas Thornton, deputy town clerk, and Mr. W. T. Lancashire, city engineer.

Loughborough T.C. (February 8th. Mr. R. H. Bicknell). £5,500 for building a fire engine station and depot.—It was stated that the estimated cost of the fire engine station was £2,012, and that a larger depot was necessary, the present premises being quite inadequate for storage purposes.

Manchester T.C. (February 10th. Mr. P. M. Crosthwaite).—£60,000 for works of sewerage, and £1,775 for the purchase of property in the township of Flixton adjoining the Davyhulme sewage disposal works.—The deputy town clerk, Mr. P. M. Heath, submitted the case for the city council. No opposition was offered to the borrowing of the £60,000, but the proposed purchase of property in Flixton was resisted by certain property owners in the neighbourhood. As regards the sewerage scheme, the city surveyor, Mr. T. de Courcy Meade, stated that the money was needed for new sewers at East Didsbury, Parrswood, Mauldeth-road to Moseley-road, and for the drainage of Millgate-lane and Stenner-lane.

Newton Abbot R.D.C. (February 9th. Mr. W. O. E. Meade-King).—£3,100 for an additional water supply for Bovey Tracey.—Mr. S. C. Chapman, water engineer to the Torquay Town Council and engineer for the scheme, said the population to be supplied was 2,300, and provision was being made for supplying 3,000. The idea in obtaining additional water from Yarner was to supplement the existing supply, and to allow of water being carried to a higher point than could be done at present. It was proposed to take the additional water direct into the existing main, and if the supply became inadequate through the erection of additional houses it could be easily supplemented by a reservoir.

Sheffield T.C. (February 4th. Mr. M. K. North). £10,000 for the purchase and laying out of land at Tinsley Park Wood as a municipal golf course.—The town clerk said the city council had opened a course at Woodseats, and in eight months they had sold 30,847 tickets, at 3d. each, which had brought them in over £385. Sir William Clegg, on behalf of the city council, said that the idea of having golf courses in public parks had been considered, but it was considered too dangerous. A nine-hole course at Abbey Lane had been very popular, in spite of it being indifferent and difficult of access. They thought they would be able to pay their way with the present scheme.—£6,365 for the erection of a chapel (to seat 150), an entrance lodge, and a registrar's residence and offices, in connection with the proposed new cemetery at Abbey-lane.—An inquiry was also held into a proposal to borrow £350 for additional bowling greens at Abbeyfield Park and Bole Hills recreation ground.

Warrington T.C. (February 4th. Mr. F. O. Stanford.—This was an inquiry into an application in connection with a scheme for widening and improving the Market-gate and Sankey-street, Warrington.—This is part of a scheme for the improvement of the centre of the town, and will involve the demolition of two hotels, the Blackburne Arms and the Pelican, the Market Hall, erected in 1855, and large business premises. A portion of the improvement has already been carried out. Mr. A. T. Hallaway, deputy town clerk, said it was the intention of the corporation to make provision as far as possible for the reinstatement of owners and tenants affected by the scheme.

APPLICATIONS FOR LOANS.

Bournemouth T.C.—£3,400 for the erection of public conveniences.

Burnley T.C.—£30,942 for the erection of two schools.

Darlington T.C.—£2,650 for school extension, and £18,500 for the extension of the electricity works.

Durham T.C.—£850 for road and other improvements.

Exeter T.C.—£7,724 for the extension of the waterworks.

Farnham U.D.C. £4,250 for drainage schemes.

Hastings T.C. £1,025 for the provision of a rate office.

Holywood U.D.C. £5,500 for a water supply scheme.

Kirkby U.D.C.—£2,190 for waterworks extensions.

Nelson T.C.—£3,000 for water mains.

Newport (Mon.) T.C. £11,820 for a drainage scheme.

Pontefract T.C.—£2,250 for public baths, and £2,500 for street improvements.

Wakefield T.C.—£4,000 for electricity mains, transformers and sub-stations.

LOANS SANCTIONED.

Axminster R.D.C. £1,515 for works of water supply.

Barking U.D.C.—£3,519 for the second portion of the St. Paul's-road scheme.

Barrow-in-Furness T.C.—£375 for a road improvement.

Batley T.C. £3,150 for street improvements.

Bournemouth T.C.—£7,800 for wood paving works.

Cheriton U.D.C. £2,000 for a street improvement.

Croydon T.C. £3,000 for sewage works extensions.

Doncaster R.D.C.—£1,150 for the erection of workmen's dwellings.

Horbury U.D.C.—£4,161 for a public hall and offices.

Leek U.D.C.—£1,030 for the purchase of land for extension of gasworks; £2,455 for the construction of new streets; £314 for the purchase of land for allotment purposes; and £3,660 for the laying out of Brough Park.

Nottingham T.C.—£34,536 for the Carter Gate improvement.

Porthcawl U.D.C.—£8,000 for laying an additional water main.

Reading T.C.—£14,500 for the extension of the sewage disposal works.

Wakefield T.C.—£1,300 for the purchase of land for hospital extension.

Wrexham R.D.C.—£11,000 for workmen's houses.

FORTHCOMING INQUIRIES.

	FEBRUARY.	£
15.—	**Brighton.** For the provision of public conveniences (Mr. R. H. Bicknell)	1,880
15.	**Hove.** For the provision of refuse crushing machinery (Mr. R. H. Bicknell)	5,000
16.—	**Aldershot.** For the provision of public conveniences (Major J. Stewart) ...	495
16.	**Nottingham.** For road and sewerage works (Mr. M. K. North)	2,000
16.	**Ramsgate.** For road widening work (Mr. Edgar Dudley)	300
17.—	**Mareham-le-Fen.** For the provision of a burial ground (Mr. M. K. North) ...	200
17.	**Margate.** For the provision of a recreation ground and street works (Mr. Edgar Dudley)	1,200
17.—	**Surbiton.** For works of sewage disposal (Mr. R. G. Hetherington)	1,000
17.—	**Willesden.** For street and sewerage works (Major J. Stewart)	7,016
18.	**Southgate.** For private street works (Major J. Stewart)	781
19.	**Ealing.** For the provision of slipper baths (Major J. Stewart)	3,120
19.	**Wallington.** For the provision of a recreation ground (Mr. Edgar Dudley)	1,000
23.	**Prudhoe.** For the purposes of a housing scheme (Mr. C. H. Eyles)	6,000
25.	**Bradford.** For the purposes of a housing scheme (Mr. C. H. Eyles)	7,200
26.	**Darfield.** For the purposes of a housing scheme (Mr. C. H. Eyles)	15,425

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Cambridge, East Riding, Finchley, Plymouth; housing and town planning—Chester-le-Street; roads and materials—East Sussex, Herts, Marylebone, Paddington; sewerage and sewage disposal—Doncaster, Penarth; water, gas and electricity—Exeter, Oswestry.—Particulars of other projected works will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Aldershot U.D.C.—The plan and estimate of the surveyor, Mr. F. C. Uren, for the erection of a public convenience in the Municipal Gardens has been approved.

Bournemouth T.C.—The borough engineer, Mr. F. W. Lacey, has received instructions to prepare plans of two new groynes, each about 200 ft. long, at an estimated cost of £2,000.

Brierley Hill U.D.C.—The council have approved the plan of the surveyor, Mr. J. L. Harpur, for an additional public convenience.

Cambridge T.C.—The Local Government Board have sanctioned the scheme for the extension of the Guildhall and the free library buildings, and granted the loan for the works.

East Ham T.C.—An extension of the office accommodation at the electricity generating station is to be effected, at an estimated cost of £300.

East Molesey U.D.C.—The Highway Committee recommend the erection of a new bridge for vehicular traffic over the water-splash in Summer-road. The present primitive ford is certainly one of two anachronisms in the road—the other being a railway level crossing.

East Riding C.C.—It is announced that the Local Government Board have approved the scheme for the provision of an isolation hospital at Great Driffield, at an estimated cost of £13,275.

East Sussex C.C.—The council on Tuesday last authorised the Roads and Bridges Committee to expend a sum not exceeding £5,000 upon sea-defence works.—The council approved a report by the county surveyor, Mr. F. J. Wood, recommending certain repairs and renovations at the county hall, Lewes.

Exeter T.C.—By direction of the Board of Education the plans of the proposed new school have been revised by adding a mechanical laboratory, at an extra cost of £742. The total estimated cost of the building is £3,142.

Finchley U.D.C.—A decision has been reached to erect a hospital for Finchley and Hendon patients, at an estimated cost of £50,000.

Lincoln T.C.—Public baths are to be provided at the East End at an estimated cost of £400.

Perth T.C.—The council are advised to carry out extensions at the electricity works, at an estimated cost of £4,000.

Plymouth T.C.—The council have approved the proposed extension of the borough lunatic asylum at Blackadon to accommodate 440 additional patients, and Messrs. Thornely, Rooke & Barron, architects, have been instructed to prepare plans. The cost of the extension is estimated by the borough treasurer at £100,000.

Salford T.C.—Amended plans of the proposed sanatorium at Marple have been forwarded to the Local Government Board. The estimated cost shows a reduction of upwards of £5,000.

Shropshire C.C.—The tender of Messrs. Hobrough, Gloucester, at £1,421, has been accepted for widening and improving Ercall Mill Bridge.

Southgate U.D.C.—It has been agreed to erect a public convenience at the Triangle, at an estimated cost of £1,800.

West Sussex C.C.—Mr. Howard Humphreys, as consulting engineer, has reported upon the condition of Norfolk Bridge—a structure of the suspension type—and as a result the council have resolved to make an order closing the bridge to all vehicles which, together with their load, exceed over 2 tons in weight. The question of strengthening the bridge is to be considered.

HOUSING AND TOWN PLANNING.

Chester-le-Street U.D.C.—In regard to the scheme for the provision of 196 houses, the council have accepted the tender of Mr. John Douglass, Newcastle-on-Tyne, at £10,360, for building the first fifty.

Settle R.D.C.—Four housing schemes have been prepared, and have been submitted to the several parishes concerned for their consideration.

Teddington U.D.C.—It was on Monday decided to inform the Local Government Board that the council are not at present disposed to proceed with a town planning scheme.

PARKS AND OPEN SPACES.

Blackpool T.C.—The borough surveyor, Mr. J. S. Brodie, has received instructions to obtain tenders for laying out a new recreation ground and bowling green at Highfield-road, South Shore.

ROADS AND MATERIALS.

Aldershot U.D.C.—It has been agreed to purchase a steam motor wagon from Fodens, Limited, estimated to cost £600, as per the following specification: 5-ton standard wagon, combination water cart (1,000-gallon tank), and tipping wagon. If the sanction for two is received, a second motor wagon can be purchased at a later date if deemed advisable.

Bristol T.C.—The consulting engineer, Mr. T. H. Yabbicom, has arranged terms for the purchase of 2,678 super. yds. of land in Parry's-lane for the purpose of an improvement. The total cost, including the re-erection of the boundary, is £902.

Darlington R.D.C.—A scheme for the improvement of Lingfield-lane, at an estimated cost of £2,300, is under consideration.

Carmarthenshire C.C.—In reply to applications made for grants in respect of the cost of road improvements, the Road Board wrote they could not depart from their decision to refuse the grant to Tro'rderlwyn, Brynamman, because the work was commenced prior to an application being made for a grant. As to other schemes, they would consider the applications when the necessity of providing employment arose, for so far they had no advice from the Local Government Board of unemployment in any part of Carmarthenshire. The council appointed a deputation to interview the Road Board on the subject.

East Ham T.C.—A letter having been received from the Road Board intimating that they could only consider a grant towards the cost of resurfacing various main roads in the event of considerable unemployment prevailing in the borough, the borough engineer, Mr. J. E. W. Birch, and the borough treasurer have been appointed to approach the board again on the subject.

East Sussex C.C.—The council on Tuesday last adopted a report by the Roads and Bridges Committee stating that the committee had had before them a report by Mr. Anthony A. I. Pelham, chief assistant to the county surveyor, dealing with the economy of tarred roads, compared with untarred roads; and on his recommendation the committee decided to ask the council to authorise the county surveyor to purchase twenty-five small tar boilers at a cost not exceeding £150. They also recommended that where the surfaces of main roads are being tarred, the tarring shall, if necessary, include the portions of such roads which it is proposed to break up in the following season.—The council authorised the Roads and Bridges Committee to expend a sum not exceeding £31,000 on the supply and haulage of road material for the year ending 31st March, 1916.

Egham U.D.C.—The council have approved the proposals of the county council to improve the dangerous corners at the Glanty (at an estimated cost, for road only, of £207) and at Shrubbs Hill (at an estimated cost, for road only, of £112).

Finsbury B.C.—It is proposed to widen Jerusalem-passage at an estimated cost of £550, and application

[illegible] been made to the London County Council for [illegible] consideration in and of the work.

Gainsborough R.D.C. The estimate of the surveyor, Mr. R. Maxwell, amounting to £9,462 for highway maintenance for the ensuing year, has been approved. It was stated that £2,400 was for wages, and that there was no increase in the estimate. Mr. Maxwell said he was glad to state that it was not necessary to increase the costs of the roads, notwithstanding that the traffic was very much heavier than in former years. He attributed the preservation to the policy of the council in being among the first authorities to adopt tarred rolling and to utilise the best material.

Haddington C.C.—The Western District Committee have resolved upon a road improvement scheme at Seton, the estimated cost of which is £3,000.

Henley T.C.—The borough surveyor, Mr. C. F. A. Pratt, has been instructed to give special attention to the sanding of the [illegible] road in the event of frost, and to [illegible] for the purpose.

Herts C.C.—A comprehensive scheme of road improvement, estimated to cost £140,449 has been adopted. The Road Board have made a grant of half the cost of the work.

Hull T.C.—A scheme for the improvement of Holderness-road is progressing, land to the value of £850 having been purchased for the purpose.

Lanarkshire C.C.—It has been resolved to promote a petition opposing the Caledonian Railway Provisional Order, 1915, in order to raise the question of the proposed [illegible] for the running of motor omnibuses.

Maesteg U.D.C.—The surveyor, Mr. J. Harpur, has been authorised to carry out improvements at four roads.

Marylebone B.C.—It has been decided to carry out works of [illegible] at an estimated cost of £9,163.

Middlesex C.C.—An estimate of £4,000 has been passed in connection with the acquisition of the land for the Great West Road.

Paddington B.C.—It has been resolved to proceed with wood paving renewals, at an estimated cost of £12,500.

Poole T.C.—Plans are being prepared for the widening of Fernside-road.

Shropshire C.C.—In order to provide employment consequent on the closing down of certain plant of the Lilleshall Company, it has been agreed to strengthen the Priorslee and Burlington road, at a cost of £2,860, and the Wellington and Newport road, at a cost of £2,730. Half the cost in each instance will be met by the Road Board, who will also advance, free of interest, the remainder of the cost, repayable by five annual instalments.

Sunbury U.D.C.—The Road Board have agreed to grant £922 towards the proposed [illegible] of Staines-road with Tarmac.

Uckfield U.D.C.—The council have approved the draft specification and plans of the proposed reconstruction of Ridgwood Hill, and tenders are being invited for the work.

Winchester R.D.C.—Improvements are to be carried out on roads in the vicinity of the military camps, at an estimated cost of £3,134, which will be met by the War Office and the Road Board.

SEWERAGE AND SEWAGE DISPOSAL.

Bradford T.C.—There have been negotiations for some time between the corporation and the Guiseley Urban District Council as to the disposal of the Guiseley sewage. Recently the Bradford Sewage Committee passed a resolution that an agreement be drawn up by the town clerk (Mr. Frederick Stevens) to treat the sewage of Guiseley for a period of thirty years, subject to the payment by the urban council of a sum equal to 1s. 2d. in the £ of the rateable value of the district, and of £95 received from the Yeadon Urban District Council for the treatment of sewage. The corporation are to take over all the council's freehold land and buildings now used for sewage disposal purposes, and loans not exceeding a total of £4,750.

Doncaster T.C.—It has been resolved to make the proposed scheme of sewage disposal the subject of competition, with prizes of £300, £200 and £100 for the three best designs.

East Ham T.C.—A letter has been received from the Local Government Board stating that they were prepared to sanction the council's application to borrow £4,028 and £3,359 for the provision of additional tanks and contact beds at the sewage disposal works.

Maidstone R.D.C.—The surveyor, Mr. W. T. A. Busbridge, has been instructed to prepare a scheme of sewerage for the Marden district.

Morley T.C.—Sewerage works are to be carried out in Albert-road, at an estimated cost of £1,600.

Oswestry R.D.C.—The sewerage scheme for Ifton Heath, prepared by Messrs. Berrington, has been referred to the parish council for their consideration.

Penarth U.D.C.—A sewage disposal scheme for the western part of the town is to be carried out, at an estimated cost of £15,000.

Teddington U.D.C.—At Monday's meeting it was decided to accept the tender of Mr. J. T. Moran—who is already the contractor for the first half of the sewerage extension scheme—for the remaining work, at £22,298. The proposed arrangement with Mr. Fairley, the engineer to the scheme (referred to in THE SURVEYOR of January 22nd) will not be proceeded with.

Uxbridge R.D.C.—The surveyor, Mr. J. W. Harrison, has been asked to include details of the ejector system in submitting a report on the Hare-[illegible] drainage [illegible].

WATER, GAS, AND ELECTRICITY.

Exeter T.C.—[illegible] has approved a [illegible] scheme for the development and extension of the waterworks at Pynes, at an estimated cost of £7,700.

Leeds T.C.—The [illegible] has passed a resolution directing the Gas and Tramways and Electricity Committees [illegible] sub-committee whose duties shall be to consider and report to the full committee from time to time on all questions relating to the [illegible] to consumers, with a view of preventing and avoiding overlapping and competition in the sale of [illegible].

Oswestry R.D.C.—The Local Government Board have sanctioned a scheme for the extension of the Western Rhyn waterworks.

Plympton R.D.C.—A new water [illegible] has been provided for a [illegible] at an estimated cost of £877.

St. Just R.D.C.—The water engineer, Mr. F. C. Uren, in a report, recommends the council to adopt a [illegible] supply from the Geevor [illegible]. The estimated cost of the project is £6,640.

Teddington U.D.C.—It has been decided to adopt the automatic system of lighting and extinguishing the public lanterns, the council undertaking the [illegible] and future [illegible] of the [illegible].

Warrington T.C.—It has been agreed to carry out a scheme for safeguarding the domestic water supply by drawing and filtering river Mersey water for manufacturing purposes.

Windsor T.C.—The borough surveyor, Mr. E. A. Stickland, has been instructed to prepare plans of foundations for five Dedor filters which the council propose to instal.

MISCELLANEOUS.

Edinburgh T.C.—The Streets and Buildings Committee have agreed to recommend an increase of 1s. a week to paviors and labourers in the roads department, which would add £91 to the yearly pay bill. They also agreed to recommend that the wages of the temporary men in the drainage department engaged in reconstructing the sewers, should be increased from 27s. 6d. to 30s., and that they should be put on the same footing as the permanent men.

Lowestoft T.C.—The borough surveyor, Mr. G. H. Hamby, has completed his survey of the groynes on the north and south beaches, and has submitted plans showing their present condition and the renewals necessary. His estimates of the cost of the renewals are as follows: For the north beach £4,885, and for the south beach £7,880, making a total of £12,765. The matter is to be considered by the Sea Defence Committee.

Yarmouth T.C.—The council have approved a plan submitted by the Town Planning Committee for the widening and diversion of certain roads; the provision of additional roads; the restriction of the num-

ber of buildings to the acre; the use of certain land for manufacturing and trade purposes: the provision of public and private open spaces; and the setting apart of ground for the extension of Gorleston cemetery. An instruction was given for the portion of Lowestoft-road within the area to be widened to 100 ft.

PERSONAL.

Mr. H. G. Warne has been appointed surveyor and inspector to the Kingswood Urban District Council.

Mr. Adam Simpson, assistant burgh surveyor of Kilmarnock, has been appointed burgh surveyor and water engineer of Troon.

Mr. Bertram C. Hammond, Shirehall, Worcester, has been elected an associate member of the Institution of Civil Engineers.

Mr. J. N. Stirling, burgh surveyor of Helensburgh, has received the appointment of sanitary inspector held by the late Mr. John Mowatt.

Mr. J. W. Stevens, surveyor and inspector to the North Walsham Urban District Council, has been granted an increase of salary of £20 a year.

Mr. J. A. Phillips, St. Mabyn, Cornwall, was on Wednesday appointed surveyor to the Newton Abbot Rural District Council in succession to Mr. W. Olver.

Mr. W. J. Cutbill, chairman of Claridge's Patent Asphalt Company, Limited, 3 Central Buildings, Westminster, S.W., died, we regret to state, on the 27th ult.

Mr. Michael Moyniham, a member of the borough surveyor's staff, was on Monday appointed deputy borough surveyor of Dublin. The appointment of deputy had been in abeyance for a number of years.

Mr. George Calvert, road surveyor of No. 1 District, County of Aberdeen, has been appointed by the Haddington Western District Committee road surveyor for the area in succession to the late Mr. Thomas Callen.

Mr. James Wallace, who had been surveyor to Panteg Urban District Council for twenty years, and was previously surveyor to Llanffrechfa Upper Urban District Council, passed away at Griffithstown on Wednesday.

Mr. T. A. Peace was on Tuesday last appointed docks engineer of Bristol, at a salary of £1,000 a year, rising to £1,200, in succession to the late Mr. W. W. Squire. Mr. Peace was a member of the docks engineering staff.

FOR OTHER ADVERTISEMENTS
See End of Paper.

RURAL DISTRICT OF WILLITON.
ASSISTANT HIGHWAY SURVEYOR.

The Williton Rural District Council invite applications for the post of Assistant Highway Surveyor for their District at a commencing salary of £90 per annum.

The person appointed will be required to work under the direction of the District Surveyor, and he must provide a motor bicycle for his own use.

Further particulars can be obtained on application to the undersigned.

Applications, stating age and qualifications, accompanied by copies of not more than three recent testimonials, must be received by me not later than noon on 22nd February, 1915.

FRANK RISDON,
Clerk.

Williton, Taunton.
February 10, 1915. (2,361)

ROMFORD RURAL DISTRICT COUNCIL.
Assistant required for the duration of the War. Must be a good surveyor, leveller and draughtsman, and accustomed to superintending building, sewerage, and street works.

Salary £120 per annum.

Preference will be given to applicants ineligible for military service.

Apply with full particulars and copies of testimonials to

W. J. GRANT.
Surveyor.

16A South-street.
Romford, Essex. (2,358)

A MUNICIPAL ENGINEER in Lancashire requires an experienced Temporary Engineering Assistant. Salary £3 per week. State age and qualifications, with copies of three recent testimonials, to Box 1,505, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C. (2,357)

THE SURVEYOR to a Rural District Council in the Midlands is prepared to take a Pupil in his office, where a good general experience—water supply, sewerage, and road construction—could be obtained. Moderate premium. Apply Box No. 1,501, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C. (2,359)

THE URBAN DISTRICT COUNCIL OF BARNES.
ANNUAL CONTRACTS.

The above Council is prepared to receive Tenders for the Supply of the following for the twelve months ending 31st March, 1916:

1. Broken Guernsey or Alderney Granite.
2. Broken Pit Flints and Thames Ballast.
3. Horses and Carts on Hire.
4. Disinfectants.
5. Ironmongery, &c.
7. Portland Cement.
8. Forage and Litter.
9. Granite Kerb and Channel.
11. Oils, Paints, &c.
12. Stoneware Pipes, &c.

Particulars and Forms of Tender may be obtained of the Engineer and Surveyor at the Council House, where Tenders, sealed and endorsed "Tender for ....," must be sent in not later than twelve o'clock noon on Monday, the 8th day of March, 1915. No Tender will be considered except on the prescribed Form.

The Council will not be bound to accept the lowest or any Tender.

(By order)

G. BRUCE TOMES, Assoc.M.Inst.C.E.,
Engineer and Surveyor.

The Council House,
High-street,
Mortlake, S.W. (2,362)

DESBOROUGH URBAN DISTRICT COUNCIL.

The above Council invite Tenders for the supply of :—

Broken Granite.
Slag.
Gravel.
Sanitary Pipes, &c.
Blue Bricks and Paviors.
Portland Cement.

Particulars and Forms of Tender may be obtained from T. F. Parker, Deputy Surveyor, Council Offices, Desborough.

Tenders, sealed and endorsed, must be delivered to the above not later than Wednesday, February 24, 1915.

Samples must accompany Tenders for Road Materials.

The Council do not bind themselves to accept the lowest or any Tender.

(By order of the Council)

EUSTACE R. LANE,
Clerk.

George-street, Kettering.
February 10, 1915. (2,360)

BOROUGH OF CHEPPING WYCOMBE
WATER DEPARTMENT.

The Corporation invites Tenders for the Supply of Galvanised Tubes, Bib and Stop Cocks, and Valve and Stopcock Boxes for the year April 1st, 1915, to March 31st, 1916.

Particulars and Form of Tender may be obtained at the Office of the undersigned, to whom Tenders, endorsed "Waterworks Stores," must be delivered by Saturday, March 6th, 1915.

T. J. RUSHBROOKE,
Waterworks Engineer.

Easton-street,
High Wycombe.
February 9, 1915. (2,353)

ENGINEERING JOTTINGS.*

7. THE CONTROL OF FLOODS.

By HERBERT G. COLLES, Assoc.M.Inst.C.E.

It is not within man's power to control rainfall or tidal waves, but it is possible to increase or control flood water and river pollution, although a good deal has been done. Why is this? Because the local authorities have given no general power to deal with pollution or to deal with floods, and even where powers were given they could be used only [illegible]. The municipal councillor, a very able watchdog of rates, on the other hand, compiled with every desire to do good, keep the several authorities up to their duties. The pressure of ratepayers' bills and their constant appeal for local economy [illegible] and control.

That unnecessary floods do very often occur to the loss of many interests in certain localities is not to be disputed, although the loss to ratepayers may be [illegible] forget the calamity when it is past. At the time of a drought people wish for rain, and plenty of it; floods seem very remote and not of sufficient moment to worry about. Thus even a flood inflicting [illegible] ords a few days' [illegible] long enough to compel the sustained attention of a majority of the inhabitants, but long enough to decide [illegible] learnedly to give out how many tons of rain per acre fell in an hour. Some of these tons of rainfall are badly wanted at times of drought; but, of course, all of them have been allowed to escape, or [illegible] or controlling having been carried out. In Egypt the Government acts differently, and the Nile is controlled to the immense benefit of that country. It does not seem a good excuse for inaction that here our waterways are insignificant compared to that great river. The fact is that the care of the waterways of our country, generally speaking, is absolutely neglected from want of someone strong in purpose and authority determined to inaugurate a system of control.

There was a Select Committee appointed by the House of Lords in 1877 to inquire into the operation of existing statutes in regard to the formation of, and proceedings by, Commissioners of Sewers, and Conservancy, Drainage and River Navigation Boards. The evidence was not only interesting, but most convincing of the necessity for dealing with floods; but no legislation has been passed, although Conservancy Bills were introduced into Parliament in 1881 and 1882.

The Royal Commission on Sewage Disposal, appointed in 1898, reported in favour of [illegible] River Boards with the widest [illegible] powers. That is something but no Act [illegible] been ground out of the legislative mill.

It is quite impossible for riparian owners, as individuals, to do what is necessary to the rivers to prevent flood. This is not to be wondered at [illegible] see of men [illegible] to agree upon what should be done, and still less upon what the individual apportionment of the cost of the work should be. These powers must be conferred upon bodies having authority to clean out, straighten, embank or divert rivers and streams as may appear to be most desirable to them.

Perhaps however the great stumbling block to the way of legislation has been the devising of an equitable rating scheme. The bills of 1881 and 1882 provided for the division of the country into three classes of lands, viz., lowlands, midlands and uplands, those lands subject, in fact, to ordinary floods, those to occasional floods, and those to exemption from floods. Whatever the rating scheme eventually decided upon, it can scarcely be more revolutionary than much of the ordinary non-party output of the times, everyone has moved since the 'eighties.

Here is a question for economists. How much capital expenditure on works might be spent to save a loss, say, of £5,000 once in every ten years? There are cases where an initial expenditure of £5,000 would prevent a disastrous flood in a town for a century. Yet, instead of the outlay of a penny in preventative measures, the recurring flood has to be submitted to because there is no power to move. Prehistoric man, doubtless, took the precaution of having his hut or cave above flood height; but we build our dwellings close to the ordinary flowing stream, assumed—but unconcerned that [illegible] time a [illegible] will be [illegible] a flood [illegible] will be trouble.

Prehistoric man, too, did not build obstructive bridges to dam back the flood water; nor did he throw all manner of rubbish into his river—at least we hope not. Think of the horror that would be caused in one of our county boroughs if someone tipped up a barrowful of garden refuse in the middle [illegible] kinds of rubbish because people generally think it [illegible]

What [illegible] the [illegible] flood water? Of course it is at present impounded in reservoirs for the feeding of canals, and the water supply of towns. Could [illegible] be [illegible] for [illegible] purposes?

As [illegible] may be flowing along above, that the underlying permeable strata is full to overflowing with water—[illegible] with advantage, and flood water poured into the penetrated receptive strata, so that the natural under- [illegible] property [illegible]. It is known that the tendency of modern land drainage [illegible] into the rivers and streams, and this naturally prevents the percolation of water into the strata so freely as formerly. Where it is known that a shortage in underground water exists, it would be well [illegible] be [illegible] to pay.

Powers granted to Rivers Boards for the control of floods would bring into prominence the question of the establishment and conservation of public water supplies, the use of any available water power, the regulation of boating and pleasure facilities, the consideration of navigation projects, the cultivation of fisheries, and a new outlet for the employment of [illegible]

For "Jottings" 1-6, see issues of April 24th, May 1st, May 8th, May 15th, June 5th, and July 10th, 1914.

THE ENGINEER.

[illegible]

[illegible] Daily News

[illegible]
[illegible]
[illegible]

ENGINEERING OPERATIONS FOR THE PREVENTION OF MALARIA.*

By Frank Dudley Evans, Assoc.M.Inst.C.E.

Anything which relates to the health of communities and labour forces is of importance to engineers, but the disease referred to in this paper—malaria—is of particular interest to them. The effects of malaria are often terrible, and may lead to very high death-rates. Its effect on works in new countries is greatly to increase their first cost and cost of maintenance, and it may lead to their abandonment.

Malaria occurs more or less in all warm climates, and is caused by parasites of the blood which are injected by anopheline mosquitoes. These mosquitoes first take the parasites from infected man when sucking blood; thus part of the life of the parasite is spent in man and part in the mosquito. Quinine is the remedy for malaria. No attempts to transmit malaria, except through the agency of mosquitoes, have been successful.

Mosquitoes are distinguished from other insects by various characteristics, but, like other insects, their life is divided into four stages—the egg, the larva, the pupa, and the imago. The egg is laid on water and develops into the imago, or adult winged insect, in about ten days. Mosquitoes are favoured by certain conditions and diminished by others.

The principal families of mosquitoes that concern man are those belonging to the groups *Culex*, *Stegomyia*, and *Anopheline*. Some *Culex* mosquitoes carry elephantiasis; some *Stegomyia* mosquitoes carry yellow fever; some anopheline mosquitoes carry malaria.

Anopheline larvæ and adults may easily be distinguished from *Culex* and *Stegomyia*. They are, as a rule, swamp breeders; hence the long-observed association of marshes with malaria.

The measures to combat and prevent malaria are: (1) Destruction of anopheline mosquitoes, either of adults or larvæ; (2) protection of man from the bites of infected mosquitoes; (3) Prevention of mosquito infection by suitable treatment of infected man.

Most malarious countries have applied, to some extent, one or all of these measures. Quinine may be used as a remedy and a preventive. Screening is effective in keeping mosquitoes away from man under certain conditions. Mosquito larvæ may be killed by oiling or poisoning their breeding-places, or breeding-places such as water vessels may be screened.

The most important method of reducing anophelines is by drying land by means of thorough drainage. In hill-land subject to heavy rainfall such work presents many novel problems, but has been successfully accomplished in the Federated Malay States at a reasonable cost.

Ravines in the Malay States, unless exceptional, can only be laid dry by a continuous drain running completely round the hill-foot, cut on a line at a little above the wet surface level. Open earth or masonry drains are useless for the purpose, and it has been found that the only way to construct permanent hill-foot drains is to use agricultural drain-pipes as subsoil drains, and to provide outlet drains of open masonry or subsoil pipes to carry off their discharge. The pipes are proportioned to run not more than one-quarter full in ordinary dry weather (one-fifth full for drains over 6 in. in diameter). The use of pipe drains less than 4 in. in diameter is not ordinarily advisable owing to the liability of their choking. The pipes are laid at a depth of 3 ft. to 4 ft. (or even deeper on steep slopes); they have been laid at the heads of ravines on slopes of 1 in 3 with satisfactory results.

Trees must be removed from the vicinity of pipe drains, as their roots may grow into and choke the pipes. Undergrowth and long grass should not be allowed to grow up for the same reason.

As economy is all-important in anti-malarial work, it is rarely possible to provide masonry drains large enough to carry all flood water, and these are, therefore, usually calculated to run one-sixth to one-fifth full in ordinary dry weather, and are surcharged during floods. An inexpensive and thoroughly efficient type of drain has been evolved to meet the conditions, this being formed of concrete blocks of half-egg shape laid close but unjointed. The blocks are laid without foundations, even on bad ground in flowing water. Should they move out of line or gradient, it is easy to reset them correctly when the surrounding ground has settled, after which they give no trouble; but resetting is rarely necessary.

The principal difficulty in draining hill-land lies in maintaining the drained surface undamaged. After some years' experience it has been found that the most economical method is the use of grass kept close cut. Small masonry dams are used in rock cuttings, and timber dams are used under certain circumstances. The method to be used depends on the quantity of silt carried by flood water. With proper care open drains may be connected to subsoil drains if necessary. Maintenance of drainage work is most important, as small faults, if neglected, may cause a whole system to be ineffective.

The co-operation of engineering, land and medical authorities is necessary to success in carrying out measures directed against malaria; but engineers can effect much on construction work by giving effect to a few simple rules. Two important problems in malarious hill countries are those connected with the enormous quantities of silt which are washed off agricultural estates and mine tailings, which, if not dealt with, may do immense damage, and ruin large tracts of country.

* Abstract of paper read at last Tuesday meeting of the Institution of Civil Engineers.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. W. H. Matthews Jones, City Engineer and Surveyor, Chester.

ANNUAL MEETING AND DINNER (NORTHERN DIVISION).

The general and annual meeting will be held at the Town Hall, Newcastle-upon-Tyne, at 2.30 p.m. to-morrow (Saturday), for the discussion of general business. The meeting will be followed by the annual dinner, to be held at the Royal Turk's Head Hotel, Grey-street, at 6 o'clock p.m.

John Robinson,
Darlington. *Hon. District Secretary.*

The next meeting of the council will be held in London on Friday, February 26th.

ROYAL SANITARY INSTITUTE.

MANCHESTER MEETING.

At a meeting of the Royal Sanitary Institute to be held at Manchester on Friday next, a discussion on "The Construction of Sewers," which will be illustrated by lantern slides, will be opened by Mr. S. S. Platt, M.Inst.C.E., borough engineer of Rochdale, and on "Housing from the Sanitary Inspector's Standpoint," by Mr. H. Dryland, of the Manchester Sanitary Department.

The chair will be taken at 7 p.m. by Sir Henry Tanner, C.B., I.S.O., F.R.I.B.A.

On the following day the chairman of the Rivers Committee of the corporation, Alderman Frowde, has kindly consented to arrange for the members to inspect an interesting section of the Manchester main drainage scheme.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, but those responsible for their despatch are recommended to arrange that they shall reach The Surveyor office by noon on Wednesdays to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

ASSISTANT SURVEYOR.—February 13th.—Carmarthen County Council. £80—£100.—County Council Offices, Carmarthen.

ARCHITECTURAL DRAUGHTSMEN.—February 15th.—Southampton County Council. £182, £172 and £156 per annum.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

ENGINEERING ASSISTANT.—February 15th.—Southampton County Council. £156 per annum.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

QUANTITY SURVEYOR AND ACCOUNTANT.—February 15th.—Southampton County Council. £130 per annum.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

QUANTITY SURVEYOR.—February 15th.—Southampton County Council. £200 per annum.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

QUANTITY SURVEYOR.—February 15th.—Glamorgan Education Committee. £3 3s. per week.—Mr. W.

J. Neath, county education architect, Metropolitan Chambers, Neath.

JUNIOR ACCOUNTANT CLERK.—February 15th. Southampton County Council. £104 per annum. Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

ROAD FOREMAN.—February 16th.—Corporation of Hertford. £2 10s. per week. Mr. Alfred Baker, town clerk.

SURVEYOR'S JUNIOR ASSISTANT.—February 17th.—Corporation of Dewsbury. £70 a year. Mr. T. Oscar Kirby, borough engineer and surveyor, Municipal Offices, Dewsbury.

INSPECTOR OF NUISANCES.—February 17th.—Holsworthy Rural District Council. £75 per annum.—Mr. C. Kinsman, clerk.

TEMPORARY ENGINEERING ASSISTANT.—February 17th.—Corporation of Wigan. £110 per annum.—Mr. A. T. Gooseman, borough engineer and surveyor, Kirkgate Chambers, Wigan.

ASSISTANT INSPECTOR.—February 18th.—Corporation of Dewsbury. 35s. per week. Mr. D. L. Anderson, medical officer of health.

CLERK OF WORKS.—February 20th.—Neath Rural District Council. £2 10s. per week. The Council's Water-street, Neath.

ASSISTANT.—February 20th.—Helensburgh Town Council. £120 per annum.—Mr. J. B. Maclachlan, town clerk.

ASSISTANT.—February 20th.—Corporation of Batley. £104 per annum.—Mr. J. H. Craik, town clerk.

ROAD FOREMAN.—February 20th.—Bee and Rural District Council.—Mr. A. Burrow, surveyor, Gisburn.

ROAD FOREMAN.—February 24th.—Hollingbourne Rural District Council. £1 2s. per week.—Mr. J. S. Roper, surveyor, Hollingbourne.

COUNTY SURVEYOR.—February 27th.—County Council of Notts. £750 per annum and travelling expenses.—Mr. H. Hampton Copnall, clerk, Shire Hall, Nottingham.

SUPERINTENDENT OF HIGHWAYS.—March 1st.—Corporation of Oxford. £180—£200 a year.—Mr. W. H. White, city engineer, Town Hall, Oxford.

SURVEYOR OF HIGHWAYS.—March 2nd.—Abingdon Rural District Council. £2 10s., to a maximum of £150.—Messrs. B. & E. M. Challoner, clerk, 67 Stert-street, Abingdon.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

HIGHWAYS FOREMAN.—Corporation of Newcastle-under-Lyme. £1 15s.—£2 2s. per week.—Mr. A. A. Pattison, borough engineer and surveyor.

FOREMAN.—Somerset County Council.—County Surveyor, Wells.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

CLUTTON.—February 23rd.—Schemes for providing a public water supply, for the parishes of Chelwood, Chew Magna, Chew Stoke, Norton, Malreward, Publow, and Stanton Drew, for the rural district council. Premiums of £100 and £50 will be awarded to the first and second best competitors.—Mr. J. Sumner Dury, clerk, Temple Cloud, Bristol.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

SHEFFIELD.—February 15th.—For the erection of bowling-green pavilions in timber and brick with slate roofs, for the corporation.—Mr. F. Wike, city engineer, Town Hall.

EAST ASHFORD.—February 15th.—For the erection of a small-pox hospital, for the rural district council. Mr. T. H. Wable, 30 Alexandra-street, Westgate, near Ashford.

HIRWAIN.—February 15th.—For the erection of a school, for the Joint Schools Committee.—Mr. T. Ewing, Education Offices, Aberdare.

WARRINGTON.—February 16th.—For additions to the sanatorium, for the corporation.—Borough Surveyor.

LOCHGOILHEAD.—February 16th.—For the erection of three double cottages, for the town council.—Mr. J. Whitton, superintendent of parks, 240 George-street, Glasgow.

MONMOUTH.—February 16th.—For alterations and additions to a police station, for the Standing Joint Committee.—Mr. W. Tanner, county surveyor, Monmouth.

TRURO.—February 16th.—For the erection of four cottages, for the rural district council.—Mr. C. Hancock, 12 Princess-street, Truro.

TORONTO.—February 16th.—For the construction of a refuse-incinerating plant, for the Board of Control, Street Commissioners' Department of Street Cleansing, Toronto.

LEEDS.—February 17th.—For the erection of a boiler-house, chimney, and other works, for the corporation.—Mr. W. T. Lancashire, city engineer.

CLAREMORRIS.—February 17th.—For the erection of twenty-one labourers' cottages, for the rural district council.—Mr. J. W. Judge, clerk.

BELFAST.—February 17th.—For the erection of a caretaker's house, for the rural district council.—Mr. R. G. Jackson, clerk, Workhouse, Belfast.

AYR.—February 17th—24th.—For the erection of a hospital and additions to administrative buildings, for the corporation.—Mr. J. Young, burgh surveyor.

BEESTON.—February 17th.—For the erection of a pumping station, destructor, and messroom, for the urban district council.—Mr. W. H. Radford, engineer, Albion Chambers, King-street, Nottingham.

LEEDS.—February 17th.—For the erection of a school, for the Education Committee.—Mr. J. Graham, Education Offices, Calverley-street, Leeds.

LINDSEY.—February 18th.—For additions to a school, for the Education Committee.—Messrs. Scorer & Gamble, architects, Bank-street Chambers, Lincoln.

MANCHESTER.—February 18th.—For extensions and alterations to a golf pavilion, for the corporation.—City Architect, Town Hall.

SAXMUNDHAM.—February 18th.—For adapting certain premises as a fire station and depot, for the urban district council.—Mr. C. J. Cook, clerk.

DONCASTER.—February 19th.—For the extension of the reservoir, for the rural district council.—Mr. W. R. Crabtree, surveyor, Union Offices, High-street, Doncaster.

RHONDDA.—February 19th.—For the erection of a secondary school, for the urban district council.—Mr. J. Rees, architect, Hillside Cottage, Pentre.

WEST RIDING.—February 19th.—For additional classrooms at the Hemsworth Kinsley school, for the Education Committee.—Education Architect, County Hall, Wakefield.

SOMERSET.—February 20th.—For the erection of six cottages, for the county council.—Mr. E. Stead, county surveyor, Wells.

NEWARK.—February 20th.—For certain works at the public library, for the corporation.—Borough Librarian.

LEYTON.—February 23rd.—For the construction of underground conveniences, for the urban district council.—Mr. Ernest H. Essex, Town Hall, Leyton.

ST. HELENS.—February 23rd.—For the erection of a refuse destructor, for the corporation.—Mr. A. W. Bradley, borough engineer.

SHEFFIELD.—February 25th.—For the extension of engine-room and boiler-house and the erection of switch-rooms and stores, for the Electric Supply Committee.—Mr. S. E. Fedden, general manager, Commercial-street, Sheffield.

CASTLEREA.—February 27th.—For the extension of the waterworks, for the rural district council.—The Clerk.

MENAI.—March 1st.—For the construction of a reservoir and laying mains, for the urban district

council.—Mr. W. Owen, waterworks engineer, Dale-street, Menai Bridge.

DUNDEE. March 1st. For the construction of the foundations of the new city hall, for the corporation. City Architect.

ESSEX. March 1st. For the reconstruction of Wickford Bridge, widening of roadway, painting of ironwork, and removing existing bridge, for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

STOCKPORT. March 1st. For the erection of a refuse destructor, for the corporation. Mr. J. Atkinson, borough surveyor.

HUDDERSFIELD. March 2nd. For the erection of a tuberculosis hospital at Bradley Gate, for the corporation. Mr. K. F. Campbell, borough engineer.

BARNSLEY. March 4th. For the erection of a new town hall, for the corporation. Town Clerk.

BOMBAY. March 7th (date extended). For the erection and equipment of a refuse destructor, for the Municipal Commissioner. Messrs. Henry S. King & Co., 65 Cornhill, London, E.C.

Iron and Steel.

SHREWSBURY. February 17th.—For the supply of cast-iron pipes and specials, for the corporation.—Mr. E. W. Arnold Hewitt, engineer and manager, Waterworks Office, Shrewsbury.

EVESHAM.—February 22nd.—For the construction of about 3 miles of water mains, valves, hydrants, air valves, meter, and necessary chambers in connection therewith, for the rural district council.—Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

CHEPPING WYCOMBE. March 6th. For the supply of galvanised tubes, bib and stop cocks, and valve and stopcock boxes, for the corporation.—Mr. T. J. Rushbrooke, waterworks engineer, Easton-street, High Wycombe.

Roads.

ECCLES. February 15th. For the supply of road materials, for the corporation. Mr. T. S. Picton, borough surveyor.

SURBITON. February 15th. For the supply of road materials, for the urban district council.—The Surveyor.

SWANSEA.—February 15th.—For the supply of road materials, tar, sand, and haulage, for the rural district council.—Mr. G. R. Thomas, highway surveyor, Forestfach.

LOUTH.—February 15th.—For the supply of granite and slag, for the rural district council.—Mr. F. C. Chard, clerk.

WANDSWORTH. February 15th. For making up part of a certain street, for the borough council.—Mr. P. Dodd, borough engineer.

THIRSK.—February 15th.—For the supply of whinstone, limestone, slag and tar, for the rural district council.—Mr. C. A. Lake, highway surveyor.

MARGATE.—February 15th.—For the supply of unbroken pit flints and broken pit flints, for the corporation.—Mr. E. A. Borg, borough surveyor.

PLYMOUTH.—February 15th.—For making up certain lanes, for the corporation.—Mr. J. Paton, borough engineer.

BANBURY. February 15th. For the supply of broken granite, for the corporation. Borough Surveyor.

LEYLAND. February 15th. For the supply of broken granite, slag tar-macadam, limestone dust, kerbs, setts, rubble, and concrete and natural flags, for the urban district council. Mr. M. H. Wilkinson, surveyor, Leyland, Lancs.

DUNSTABLE.—February 16th.—For the supply of slag and slag dust, for the corporation.—Mr. W. F. Wilkins, borough engineer.

BUCKHURST HILL.—February 16th.—For making up a certain road, for the urban district council.—Mr. H. Tooley, surveyor.

FORFARSHIRE.—February 16th.—For main road reconstruction, for the District Committee.—Mr. J. B. Roberton, road surveyor, Downfield.

MIDDLETON.—February 16th.—For surfacing a carriageway, for the corporation. M. W. Young, borough surveyor.

LONG SUTTON.—February 16th.—For the supply of granite, slag, slag screenings, and Hoyt heggins, for the urban district council.—Mr. S. S. Mossop, clerk.

LANCHESTER.—February 17th.—For making up certain streets, for the rural district council.—The Highway Surveyor.

EAST SUFFOLK.—February 17th.—For steam rolling during the year ending March 31, 1916, for the county council.—Mr. W. Jervis, county road surveyor, County Hall, Ipswich.

FLAXTON.—February 17th.—For the supply of whinstone, broken annealed slag, and common slag, for the rural district council.—Mr. J. Peters, clerk, 4 New-street, Yorks.

SHARDLOW.—February 17th.—For the supply of slag tar-macadam, Leicester granite, ironstone slag, and limestone, for the rural district council.—Mr. J. S. Wooddisse, surveyor, Aston-on-Trent, Derby.

ROTHERHAM.—February 17th.—For the supply of granite and slag, for the rural district council. Mr. R. Bradbury, district surveyor, Imperial Buildings, Rotherham.

HODDESDON.—February 17th.—For work of street watering, for the urban district council.—Mr. H. Flood, surveyor.

SHREWSBURY. February 17th. For the supply of broken macadam, tarred granite macadam, tarred slag, broken slag, tar-spraying, distilled tar, crossing blocks, Yorkshire or Lancashire kerbs, flags, and channels, and concrete flags, for the corporation. Mr. A. Ward, borough surveyor, The Square, Shrewsbury.

NEWMARKET. February 18th. For the supply of best broken Leicestershire granite and tarviated granite chippings, for the urban district council.—Mr. W. H. Eley, surveyor.

KETTERING. February 18th. For the supply of granite, slag and tar macadam, for the rural district council.—Mr. J. H. Porter, surveyor.

WISBECH.—February 18th.—For the supply of granite, ironstone slag, gravel and ragstone, for the rural district council. Mr. A. Catling, surveyor, 4 Post Office-lane, Wisbech.

WORCESTER.—February 18th.—For the supply of tools, for the county council.—Mr. C. F. Gettings, county surveyor, 30 Foregate, Worcester.

BUCKS.—February 18th.—For the supply of field flints, for the county council.—Mr. R. J. Thomas, county surveyor, County Hall, Aylesbury.

READING.—February 18th.—For making up a certain road, for the corporation. Mr. J. Bowen, borough engineer and surveyor.

THAKEHAM.—February 18th.—For the supply of broken basalt or granite and unbroken flints, for the rural district council.—Mr. W. Forrester, surveyor, Storrington, Pulborough, Sussex.

CLAYPOLE.—February 18th.—For the supply of about 2,050 tons of granite, 1,300 tons of slag, and 150 tons of footpath gravel, for the rural district council.—Mr. A. J. Franks, clerk, Union Offices, 24 Lombard-street, Newark.

EAST SUFFOLK.—February 19th.—For the supply of road materials, for the county council.—Mr. W. Jervis, county road surveyor, County Hall, Ipswich.

CHESHIRE.—February 20th.—For the supply of refined tar, Trivia, or Tarco, for the county council. Mr. W. Holland, county surveyor, The Castle, Chester.

THORNE.—February 20th.—For the supply of dross, screenings, granite, tar-macadam and tar, for the rural district council.—The Clerk.

TANGIER.—February 20th.—For works of road construction and improvement, for the Special Committee of Public Works. — Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

SWINTON.—February 20th.—For the supply of granite setts, macadam, grit setts, flags, kerbs, and the stone required, for the urban district council. —Mr. H. Entwistle, Council Offices.

SIBSEY.—February 20th.—For the supply of granite, slag, and slag rejections, for the rural district council. —Mr. J. M. Simpson, clerk, 28 Wide Bargate, Boston.

BEDS.—February 20th.—For the supply of broken granite, slag, flints, and gravel, for the county council. —County Surveyor, Shire Hall, Bedford.

BELVOIR.—February 20th.—For the supply of materials, and carting, for the rural district council.—Mr. R. J. Kettleborrow, district surveyor, Normanton, Bottesford, Notts.

BILLESDON.—February 20th.—For the supply of granite, for the rural district council.—The Surveyor, Workhouse, Billesdon, Leics.

SOWERBY BRIDGE.—February 20th.—For the supply of Portland cement, pitch, lime, sand, and kerb. Yorkshire setts, flags, and kerb, for the urban district council.—Mr. Jas. Eastwood, engineer and surveyor.

MARSHLAND.—February 20th.—For the supply of granite and gravel, for the rural district council.—Mr. R. W. Lancaster, clerk, 2 Lily-place, Wisbech.

CHESHIRE.—February 20th.—For the supply of macadam, tar-macadam, and chippings, for the county council.—Mr. W. Holland, county surveyor, The Castle, Chester.

RUGBY.—February 20th.—For the supply of granite for the rural district council.—Mr. J. W. Cashin, clerk.

SEATON DELAVAL.—February 20th.—For the supply of tar, whinstone for edging, hire of steam rollers and steam labour, for the urban district council.—Mr. A. Dorin, surveyor.

MIDDLETON.—February 20th.—For the supply of macadam, setts, kerbs, and flags, for the [illegible] Chairman of the Surveyor's Committee.

MARPLE.—February 22nd.—For the supply of granite macadam and chippings, Macadam macadam and chippings, limestone macadam and chippings, 6-in. setts, and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor, Council Offices, Marple.

LITTLE HULTON.—February 22nd.—For the supply of broken granite, granite setts, granite, limestone and slag chippings, and kerbs, and steam road rolling, for the urban district council.—Mr. J. H. Heyes, clerk.

HIGHWORTH.—February 22nd.—For the repair of roads and hauling materials, for the rural district council.—Mr. O. Kimber, surveyor, Kite Hill, Wanborough, Wilts.

DONCASTER.—February 22nd.—For road improvement works, for the rural district council.—Mr. W. R. Crabtree, surveyor, Union Offices, High-street, Doncaster.

HARROGATE.—February 22nd.—For the supply of road materials, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

EPSOM.—February 22nd.—For the supply of road materials, for the rural district council.—Mr. T. E. Ware, surveyor.

HEMSWORTH.—February 23rd.—For [illegible] certain street, for the rural district council.—Mr. T. H. Richardson, Hemsworth.

SMALLBURGH.—February 23rd.—For the supply of road materials, for the rural district council.—Mr. W. L. Lewis, district surveyor, Stalham.

SOUTHALL-NORWOOD.—February 23rd.—For the supply of 3,000 tons of tarred slag-macadam and repairing road surface, for the urban district council.—Mr. Reginald Brown, engineer and surveyor.

WILLESDEN.—February 23rd.—For [illegible] certain street, for the urban district council.—Mr. O. C. Robson, engineer.

LONDON.—February 23rd.—For the supply of granite setts, for the county council.—Chief Officer, London County Council Tramways, 62 Finsbury-pavement, E.C.

MALLING.—February 23rd.—For the supply of road materials and tar, for the rural district council.—Mr. J. Marshall, highway surveyor, Springett's Hill, East Malling.

SURREY.—February 23rd.—For the supply of steam rollers and water carts, for the county council.—Mr. A. Dryland, county surveyor, County Hall, Kingston-upon-Thames.

RUSHDEN.—February 24th.—For the supply of granite and slag, for the urban district council.—Mr. W. B. Madin, engineer and surveyor.

MUTFORD.—February 24th.—For making up two roads, for the rural district council.—The Surveyor.

RICHMOND.—February 24th.—For making up certain roads, for the corporation.—Mr. J. H. Beerley, borough surveyor.

HOLLINGBOURNE.—February 24th.—For the supply of road materials, for the rural district council.—Mr. H. J. Bracker, clerk, 33 Earl-street, Maidstone.

SHEPTON MALLET.—February 25th.—For road maintenance and the supply of materials, for the rural district council.—Mr. J. Neish, surveyor.

BRIDGNORTH.—February 25th.—For the supply of granite, basalt, and slag, for the [illegible] council.—The Surveyor, Oldbury, Bridgnorth.

SOUTH SHIELDS.—February 27th.—For [illegible] and laying in situ concrete for footways and back streets, for the corporation.—Mr. L. Roseveare, borough engineer and surveyor.

LANCS.—February 27th.—For the hire of steam rollers during the year ending March 31, 1916, or for a period of three years, for the county council.—Mr. W. H. Schofield, County Offices, Preston.

STRETFORD.—February 27th.—For making up certain streets, for the urban district council.—Mr. E. Worrall, surveyor.

CAMBS.—February 27th.—For the hire of steam rollers for use on the main roads during the year ending March 31, 1916, for the county council.—Mr. H. H. Dunn, acting county surveyor, County Hall, Cambridge.

LANCS.—February 27th.—For the supply of granite [illegible] macadam, rubble, chippings, and gravel, for the county council.—Mr. W. H. Schofield, county surveyor, County Offices, Preston.

DENBIGH.—February 27th.—For the supply of road stone, chippings or screenings, tar-macadam, and tar-topping, for the county council.—County Surveyor, Wrexham.

STRETFORD.—February 27th.—For paving in rock asphalt and sewering certain roads, for the urban district council.—Mr. Ernest Worrall, surveyor.

WARDLE.—March 2nd.—For the supply of granite setts, for the urban district council.—Mr. J. D. Hurst, surveyor.

ELLAND.—March 3rd.—For making up a certain road, for the urban district council.—Mr. P. H. Whitwam, surveyor.

BINGHAM.—March 3rd.—For the supply of granite and slag, for the rural district council.—Mr. J. W. Mason, clerk.

BELPER.—March 6th.—For the supply of granite, furnace slag, and limestone, for the rural district council.—Mr. R. C. Cordon, engineer and surveyor, Duffield, near Derby.

DRIFFIELD.—March 6th.—For the supply of flint-[illegible] and tarred chippings, for the rural district council.—Mr. T. Casson Beaumont, surveyor.

CHAILEY.—[illegible] quartzite, Kentish rag, Mendip stone, and gravel, for the rural district council.—Mr. H. Kemp Walls, district surveyor, North Common, Chailey.

DISS.—For the supply and delivery of granite, for the urban district council.—Mr. Alfred Cooper, surveyor.

Sanitary.

BLEAN.—February 15th.—For the construction of stoneware pipe sewers, manholes, and other works, for the rural district council.—Mr. F. A. Ward, engineer, Roseneath, Eddington.

PAIGNTON.—February 15th.—For providing and laying storm-water drain, for the urban district council.—Engineer and Surveyor.

KEYNSHAM.—February 15th.—For the construction of sewers and manholes, for the rural district council.—Mr. H. M. Bennett, surveyor, 36 Corn-street, Bristol.

LANCHESTER.—February 15th.—For scavenging No. 2 district, for the rural district council.—Mr. J. R. Lupton, surveyor.

THIRSK.—February 15th.—For the removal of house refuse, for the rural district council.—Mr. A. Green, Holmefield-terrace, Sowerby.

CROYDON.—February 15th.—For the supply of 4,000 tons of clinker filling for the new percolating filters at South Norwood farm, for the corporation.—Borough Engineer.

CAERPHILLY.—February 16th.—For the construction of about 2,500 yds. of stone-ware sewers and other contingent work, for the urban district council. Mr. Alfred O. Harper, engineer and surveyor.

GOSFORTH.—February 16th.—For work of scavenging, for the urban district council.—Mr. R. S. Holmes, clerk.

EAST GRINSTEAD.—February 17th.—For the construction of storm-water drains, for the rural district council.—Mr. C. Turton, surveyor.

LANCASTER.—February 18th.—For emptying cesspools, for the rural district council.—Mr. Littlefair, sanitary inspector, 5 Dalton-square, Lancaster.

ROTHWELL.—February 19th. For the removal of refuse, for the urban district council.—Mr. E. F. Moorhouse, sanitary inspector.

HARTLEY WINTNEY.—February 19th.—For scavenging and cleansing cesspools, for the rural district council.—Mr. W. H. Wright, clerk, Odiham, Hants.

BROMLEY.—February 20th.—For the removal of refuse, for the rural district council.—Mr. E. Haslehurst, clerk, Park House, Bromley.

WALTON-LE-DALE.—February 20th.—For the removal of nightsoil, for the urban district council.—Mr. W. S. Woodcock, clerk, Council Offices, Bamber Bridge.

CHERITON.—February 22nd.—For the removal of house refuse, for the urban district council.—Mr. A. Atkinson, acting clerk.

WAKEFIELD.—February 22nd.—For the construction of a concrete culvert in tunnel, for the corporation.—Mr. J. P. Wakeford, city surveyor.

WOKING.—February 22nd.—For the construction of three screening chambers and detritus tanks, three sedimentation tanks, fifteen circular bacteria beds, provided with automatic distributors, six humus tanks, various lengths of effluent carriers, engine-house, sludge pump and press-house, and engine-houses for driving screens and pumping humus, and other works, for the urban district council.—Mr. G. Midgley Taylor, Caxton House, Westminster, S.W.

EPSOM.—February 23rd.—For the removal of house refuse, for the rural district council.—Mr. F. A. Pratley, surveyor.

ST. ALBANS.—February 24th.—For providing and laying new sewers, for the rural district council.—Mr. H. F. Mence, surveyor, 11 St. Peter's-street, St. Albans.

HAMPTON WICK.—February 26th.—For road watering and scavenging, for the urban district council.—Mr. H. Fawsett, clerk.

GRIMSBY.—February 27th.—For the removal of refuse, for the rural district council.—Mr. J. H. Evans, sanitary inspector.

LICHFIELD.—March 3rd.—For carrying out a sewerage scheme at Watling-street, Brownhills, including the laying of 600 yds. of 9-in., and 170 yds. of 8-in. stoneware pipe sewers, and manholes, and constructing disposal works, for the rural district council.—Mr. O. Rawstron, surveyor, The Workhouse, Lichfield.

Stores.

ECCLES.—February 15th.—For the supply of setts, flags, kerbs, broken rubble, broken slag, granite macadam and chippings, prepared tar slag, prepared tar limestone, limestone cube chippings, gravel, cinders, castings, pitch, creosote, tar, Simpson's patent street gullies, stoneware passage gullies, stoneware pipes, bends and junctions, mortar, and channel stones, for the corporation.—Mr. Thomas S. Picton, borough surveyor, Eccles.

SURBITON.—February 15th.—For the supply of team labour, broken Guernsey granite, concrete paving flags, general stores, repairing burst and damaged water pipes, cast-iron goods, tools, smiths' work, Derbyshire limestone, tar-paving materials, house refuse removal, Norway granite kerbing, Norway granite paving setts, Kent flints, gravel, Thames ballast, scavenging, slag tarred macadam, scavengers' brooms, horse sweeping brooms, machine brooms, lubricating oils, and sludge press cloth, for the urban district council.—The Surveyor, Council Offices, Ewell-road, Surbiton.

BELFAST.—February 16th.—For the supply of earthenware sewer pipes, timber, slates, hardwood, iron castings, plumber's work, nails, iron and steel, paints, oils, glazing, mill furnishings, shovels, spades, graipes, buckets, scavenging brushes, glazed bricks, artificial flags, lime, pitch, felt, tar, sea sand, sea gravel, Lough Neagh sand, and cement, for the corporation.—Mr. Hector F. Gullan, superintendent of works, City Hall.

RAWTENSTALL.—February 17th.—For the supply of road metal, earthenware pipes, gullies, timber, pitch, creosote oil, disinfectants, Portland cement, iron castings, local stone, workmen's tools, scavenging brushes, horse-shoeing, coal and coke, for the corporation.—Borough Surveyor.

WESTMINSTER.—February 18th.—For the supply of ballast and sand, boots, bricks, brooms and brushes, carriageway and footway repairs (asphalt), carriageway repairs (macadam), carriageway repairs (granite sett pavement), carriageway repairs (wood pavement), cement and lime, disinfectants, dry-saltery, dust baskets, flags, mason's work, broken granite, granite setts, kerbs, channels, stoneware gullies, harness, horse hire and cartage, hose pipe, iron castings, petroleum spirit, painters' materials, pitch and creosote oil, plates, sheets, bolts, tree guards, retyring wheels, rubber and waterproof goods, sewerage and drainage, shovels, picks, sewer implements, edge tools, stoneware goods, street name plates, tarpaulin, tar-spraying macadam roads, timber, tool handles, and wood paving blocks, for the city council.—City Hall, Charing Cross-road, London, W.C.

STOKE-ON-TRENT.—February 20th.—For the supply of Portland cement, blue paving bricks, common bricks, sanitary pipes, gullies, macadam, chippings, pitch, creosote oil, cast ironwork, picks, shovels, general ironware, paints, oils, brooms, brushes, bath towels, dusters, ironmongery, general stores and disinfectants, for the corporation.—Borough Surveyor.

MANSFIELD.—February 22nd.—For the supply of granite, slag, tar-macadam, natural flags, kerbing, channelling, concrete flags, Portland cement, stoneware pipes, junctions, bends, timber, sewer ironwork, castings, coal, ironmongery, general stores, paints, oils, varnish, brooms, brushes, disinfectants, and harness, for the corporation.—Mr. Thos. P. Collinge, borough engineer and surveyor.

SOUTHALL-NORWOOD.—February 23rd.—For the supply of granite, lime, cement, oil, alumino-ferric, waste, press cloth, disinfectants, tools, picks, shafts, dust-bins, Kentish pit flint, hoggin, gravel, horse hire, steam rolling and scarifying, forage, coal, and coke, for the urban district council.—Mr. Reginald Brown, engineer and surveyor, Town Hall, Southall.

BATTERSEA.—February 24th.—For the supply of materials for cart and van covers, harness material, paints, special paints, enamels, painters' sundries, varnish, tools, ironmongery, granite macadam and chippings, slag tar-macadam, tarred paving material for footpaths, chippings, dust, and gas tar, York paving, Thames ballast and sand, stoneware pipes, timber, bricks, cement, lime, iron castings, iron bars, scavengers' bass brooms and circular bass brooms, disinfectants and oils, for the borough council.—Mr. W. Marcus Wilkins, town clerk.

SOUTHEND-ON-SEA.—February 24th.—For the supply of stoneware pipes, bends, flints, bricks, gravel, sand, timber, ironmongery, paints, oils, colours, cement, lime, chalk, team labour, forage, tar-paving, tar-macadam, iron castings, granite kerb, channel, broken Guernsey granite, broken granite, pitch, creosote oil, harness supplies, sundries, brooms, brushes, steel, iron, and disinfectants, for the corporation.—Mr. Ernest J. Elford, borough engineer.

HAMPTON.—February 25th.—For the supply of hand-broken granite, granite chippings, broken Kentish brown flints, Derbyshire limestone, marble tar-paving material, forage, house coal and coke, and scavengers' bass brooms, for the urban district council.—Mr. Sidney H. Chambers, surveyor, Public Offices, Hampton.

SOUTH SHIELDS.—February 27th.—For the supply of Northumberland whinstone, Fifeshire whinstone, Aberdeen and Norwegian granite, slag, granite chippings, Caithness flags, Portland cement, cement-concrete flags, cast ironwork, shovels, scavengers' leather hose, sewer boots, jackets, sanitary pipes, paints, paint oils, glass, timber, iron, horseshoe nails, cart axles, springs, tar, pitch, oils, and general stores, for the corporation.—Mr. Leslie Roseveare, borough engineer and surveyor.

MIDDLETON.—February 28th.—For the supply of macadam, setts, kerbs, flags, cement, pipes, pitch and oil, and brooms and castings, for the corporation.—Mr. Frederick Entwistle, town clerk, Town Hall, Middleton.

DERBY.—March 1st.—For the supply of bricks, cement, lime, disinfectants, earthenware, freestone, gritstone, granite, gravel, sand, limestone, pitch, tar, and slag, for the corporation.—Borough Surveyor.

MARYLEBONE.—March 1st.—For the supply of road materials, horses, harness and drivers, Portland cement, oils, stoneware sewers, ironwork for sewers, and slopping, for the borough council.—Mr. J. Paget Waddington, borough surveyor.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Protection from Fire.

By [illegible] to have [illegible] objects of the [illegible] protection from fire. [illegible] substantially [illegible] opinion. One thing is certain, however—that, in spite of [illegible] stand on all the [illegible] means for preventing and minimising fire every year [illegible] and property [illegible] explosion [illegible] new industrial processes may introduce new risks, and in the second place the element of carelessness [illegible] of fire usually [illegible] in direct [illegible] second [illegible] meeting the [illegible] construction and [illegible] to fire [illegible] which was read by Mr. Whitby [illegible] meeting of the Society of Architects. Mr. Scott [illegible] a member of the British Fire Prevention Committee, he was able to add one more to the many well-deserved [illegible] has [illegible] The paper [illegible] criticism of the London Building Acts from the point of view of fire prevention, the most notable suggestion perhaps being that all floors and staircases, irrespective of the size or use of the building, should be constructed of fire-resisting material; and further, that the top floor should be [illegible] not also constructed of fire-resisting material, it would [illegible] the collapse of the roof in case of fire. Apart from the question of cost, the desirability of such an arrangement cannot be [illegible]. Mr. Scott gave some figures to show that the disparity between the cost of ordinary and fire-resisting floors, either for ordinary domestic buildings or for [illegible] first be supposed. The suggestion as to the strength of the top floor appears to us to be an excellent one, for it is [illegible] the past many fires have resulted in the total loss of the building [illegible] collapse of the roof, or one floor carrying the whole series of floors to collapse like a house of cards.

In closing his remarks in regard to matters of construction, Mr. Scott pointed out that the question of first cost must be considered in relation to the reduction in the insurance premium, and the inconvenience, loss of profit and business connection in the event of a disastrous fire. The former is a matter for the insurance company, but the latter must be estimated by the owner himself. It is worthy of note that premiums are sometimes [illegible] great importance where large and valuable stocks are kept. The concluding part of Mr. Scott's paper was concerned with the several methods that have been devised for extinguishing fires, ranging from the hand-bucket to the chemical extinguisher and automatic sprinkler. In regard to private hydrants, the author observed that in laying down an installation connection to two different mains should be made if possible. The most efficient private apparatus, however, is [illegible] reduction varying from 30 to 70 per cent. Mr. Scott stated that if a little care and attention [illegible] sprinklers are to be installed the actual construction need not be less economical. Moreover, in [illegible] installation itself. The advantages of the sprinkler are not confined to their automatic discharge when the arranged temperature is reached, but in addition they may be fitted with automatic alarm signals which give notice immediately the apparatus comes into action, and continue ringing so long as any sprinkler is in operation. Mr. Scott's paper forms a comprehensive and interesting contribution to the literature of a most important subject.

Sewage Purification and Disposal.*

The publication at the present time of a technical book, and, above all, of a book on sewage purification, indicates courage of a high degree on the part of both author and publishers. To most people it would seem that, apart from the latest developments, such as treatment by aëration and by dilution, which are intentionally omitted from the present volume, there is very little that has not already been written by one author or another about modern methods of sewage disposal. It is true that Mr. Kershaw's book forms one of the Public Health Series issued by the Cambridge University Press, and as such it certainly gives in a useful and handy form the knowledge now available in this branch of public health work. The bibliographies which are given at the end of each chapter and the quotations from American and Continental [illegible] should be very useful for reference. The various stages in the process of purification are dealt with in order, and thoroughly. The chapter on the removal of suspended matter is excellent—indeed, the [illegible] is good; but on one matter we cannot refrain from a few critical observations. It is curious to find that the correct method of constructing contact beds is only now being properly understood in many quarters. In dealing with the question of ineffective drainage

* By G. Bertram Kershaw, M.Inst.C.E., Late engineer to the Royal Commission on Sewage Disposal &c. Cambridge University Press. 1s. net.

the author suggests that "contact beds would probably give better results if the floor of each bed were formed of aërating tiles after the manner of percolating filters—this has been actually done in several instances in American practice." From this it might be assumed that this practice was first adopted in America, whereas it is now some ten years since it was introduced in connection with the large scheme of contact beds at Leicester by Mr. E. G. Mawbey, M.Inst.C.E., the borough engineer. In a paper read at a meeting of the Royal Sanitary Institute, Mr. Mawbey described these beds (The Surveyor, May 6, 1910), and was able to show that even after two years' work they had a liquid capacity of over 40 per cent of the gross capacity of the empty beds. Other engineers who have adopted the same method have had similar experience, and if all contact beds had been constructed on these lines there would have been no cause for complaints as to the loss of capacity so frequently complained of.

Again, in dealing with the treatment of brewery wastes, the author states that "contact beds are not so suitable for the treatment of brewery wastes as percolating filters." This opinion has been held by other writers, but, as we pointed out in reviewing the book on "Trade Waste Waters," by Drs. Maclean Wilson and H. T. Calvert (The Surveyor, June 13, 1913), we are acquainted with at least two cases where brewery wastes are satisfactorily treated in contact beds, and the effluent is discharged into very small streams without causing the growth of fungus or any smell whatever. Finally, in a footnote to the section dealing with the treatment of gas liquor, it is stated in reference to the treatment of the sewage of Oldbury in contact beds that percolating filters would seem to be better adapted for a sewage containing such a large quantity of wastes from a chemical works engaged in the recovery of ammonia from gas liquor, and that it is not clear why contact beds were selected. We are glad to be able to enlighten the author on this point by referring him to a report contained in Appendix IV. to the Fifth Report of the Royal Commission on Sewage Disposal, in which Mr. Colin C. Frye pointed out that triple contact filtration gave better results than triple percolating filtration when treating Oldbury sewage at the same rate per cube yard per day. We dealt with this matter some time ago (The Surveyor, May 13, 1910), and the original experiments, upon the results of which the conclusion was arrived at, were described about three years earlier (The Surveyor, July 12, 1907).

"Healthful Recreation."

Is a kinematograph entertainment "healthful recreation or exercise" within the meaning of the Baths and Washhouses Act, 1878? This was the conundrum which Mr. Justice Joyce had to answer in the case of *Attorney General* v. *Shoreditch Borough Council and Wright*. It may be remembered that the matter came before Mr. Justice Eve some months ago on motion for an interim injunction to prevent the Hoxton Baths from being used for such entertainments pending the trial of the action, and that that learned judge, answering the question in the affirmative, refused the application. Mr. Justice Joyce, however, came to the opposite conclusion. The council had let the baths for the winter season 1913-14 to the defendant Wright as a kinematograph theatre, and the action was brought at the relation of the Hoxton (Cinema), Limited. Sec. 5 of the Baths and Washhouses Act, 1878, under which the council purported to act, gives the urban authority power between November and March (both inclusive) to close a swimming bath and to establish therein a gymnasium, or such other means of healthful recreation as they shall think fit, or to allow it to be used as an empty building for such purposes of healthful recreation or exercise as they shall think fit. There was a proviso at the end of the section absolutely prohibiting the use of a swimming bath for music or dancing. This, however, was repealed by the Baths and Washhouses Act, 1899, which provides that before a bath is used for music or dancing the authority shall obtain a licence for the purpose, that no portion of the licensed premises shall be let otherwise than occasionally, and that no money shall be taken at the doors. Mr. Justice Joyce, in arriving at his decision, considered not only sec. 5 of the Act of 1878, but also the three following sections, as throwing light upon the intention of the Legislature. Sec. 6 empowers the authority to make by-laws for the use of the baths when used for any of the purposes mentioned in sec. 5; sec. 7 authorises them to appoint officers and servants for the management and superintendence of any gymnasium or other means of recreation; and under sec. 8 they can make reasonable charges for the use of the gymnasium, &c., or for the use of a covered swimming bath as an empty room.

Looking at the words "healthful recreation" entirely isolated from their context, there is, no doubt, room for difference of opinion as to whether a kinematograph show comes within their scope. It may be argued that anything which by entertaining and interesting the mind tends to recreate the tired worker is healthful recreation, while, on the other hand, it may be said that recreation involving a sedentary position in a crowded room, and a certain amount of eye-strain, however entertaining, cannot be conducive to true hygiene. But, having regard to the scope and phraseology of the Act, we think Mr. Justice Joyce's decision will be generally accepted as satisfactory. He held that in letting the baths as they had done the council were not (in the words of the Act) "allowing any covered or open swimming bath to be used as an empty building for purposes of healthful recreation or exercise," and he accordingly granted an injunction restraining the council from letting, and the defendant Wright, their tenant, from using, the baths for kinematograph entertainments. A minor point in which the decision was also adverse to the council was that, although they had obtained a licence for the use of the bath for the incidental music, the letting was "otherwise than occasionally," and money was taken at the doors—in both respects contravening the conditions laid down by the Act of 1899. The main interest of the case, however, centres in the interpretation of the term "healthful recreation."

A Bethnal Green Housing Scheme.

Under pressure from the Local Government Board the Housing Committee of the London County Council have formulated a housing scheme for Bethnal Green, in what is known as the Brady-street area. The order of the board is made under Part II. of the Housing of the Working Classes Act, 1890, and the Housing Committee in their report submit an estimate of the cost of clearing the area amounting to £53,000, £50,000 being assigned for the acquisition of property, and £3,000 for the construction of roads. The result was only reached after a good deal of correspondence with the Local Government Board, and from this it would appear that the London County Council made out a strong case for postponing the scheme to a future period when circumstances will, peradventure, be more favourable than at present for such projects. The council insisted, with much cogency, as it seems to us, that in the present state of the law the clearing of slum areas is a very costly process. It is, in fact, a process in which the factors of

[illegible] questions and evidence are [illegible] to evidence. The [illegible] falls on the [illegible] ratepayers, and the [illegible] falls on liberal measure to the [illegible] ing Committee, in defending their position, pointed out that authoritative Ministerial statements had been made indicating the form which an amended measure should take. Property taken for *inter alia*, [illegible] these statements, to be assessed at a [illegible] by a [illegible] Judicial Commissioners, and by a simplified process. Both [illegible] of course, unjustly treated, and there is something to be said for the view that if the [illegible] the [illegible] property is to be reduced by legislation it would not be desirable to pursue such projects under the existing system. However, [illegible] and under the order made by the Local Government Board the scheme will be proceeded with at an initial cost of £53,000. That the area [illegible] is clear from the extensive [illegible] permit of dispute. It consists of 20½ acres, and the clearance will involve the displacement of 1,121 persons. The Housing Committee, following the policy they pursued in the Tabard-street scheme, propose to provide accommodation for 500 persons, not a [illegible] displaced, or even [illegible] the [illegible] dwellings would let if erected. The difficulties of dealing with the improvement of housing in London are not few or inconsiderable, yet in spite of this the London County Council has rendered excellent service in the clearance of insanitary areas and the provision of habitable dwellings. It is not generally known that by means of their various schemes they have provided accommodation in [illegible] for a much [illegible] than those who have displaced [illegible] them.

* * *

Tar-spraying and Negligence.

The case of *Hoare v. [illegible] County Council* and *Fothergill Brothers*, a report of which appears elsewhere in this issue, raised some questions of special interest to municipal engineers. The [illegible] for personal injuries sustained in consequence of her being thrown out of a trap owing to the slipperiness of a road alleged to have been caused through negligence in tar-spraying. In the [illegible] specification appears to have been attached to the general directions and specifications as to the [illegible] Road Board. The fact that the work had been carried out substantially in accordance with this specification appears to have influenced the [illegible] and properly so, that there was no negligence up to the time of the completion of the work. It must not be assumed, however, from this that the specification is conclusive on the question of negligence. No doubt any tribunal or jury would attach to it the great weight which it deserves, and the fact that work has been executed in accordance with it would be strong evidence of the absence of negligence. The specification, however, is only one matter to be considered, and it is conceivable that other circumstances might in some future case produce a finding of negligence although the specification had been substantially followed. The negligence found in the case under consideration was the insufficient sprinkling of loose sand or gravel on the surface after the tar had dried and before the public were invited to use the road. The question of law then arose as to whether this neglect amounted to misfeasance, so as to bring the case within the well known rule that a highway authority are only liable for acts of misfeasance and not for mere non-feasance. The County Court Judge said that there had been misfeasance, and he therefore gave judgment for the plaintiff. The question is one of great interest and [illegible] the authorities. We observe, however, that a [illegible] appeal.

* * *

Concrete Calculations.

In another column will be found an article from the pen of Prof. P. W. [illegible] Assoc.M.Inst.C.E., Professor of Civil Engineering, University College, Cork, in which the desirability of the individual engineer keeping a systematic record of tests of samples of cement and concrete is discussed. The literature of concrete is very prolific, and yet there remains a certain vagueness about much of the information available. Prof. Alexander [illegible] to [illegible] the main factors governing the strength of concrete, to show the lines along which they can be [illegible] and controlled, and to indicate how results may be effected by the shape and dimensions of the mass, as well as by the method of applying the stress. Much of the difficulty of comparison arises from the fact that the [illegible] rials that may be used for a concrete aggregate is almost infinite, and that each has its own peculiarities. It is impossible, therefore, for the [illegible] to [illegible] derived from another concrete made in a different way and of different materials, and it is accordingly incumbent upon him to prepare his own working stress values. The detailed figures given by Prof. Alexander [illegible] interest, as illustrating the apparent superiority of small cubes [illegible] It must be remembered that the greater density obtained in the smaller ones, but the bulk [illegible] by the platens of the machine. As has been suggested by other observers, it is probable that the best test would be that in which three cubes were placed together to form a prism and subjected to axial compression, the crushing load on the middle cube being taken at the compressive strength.

* * *

Superannuation Again.

We are constantly receiving new evidences of the anxious interest which municipal engineers throughout the country take in the agitation to secure adequate superannuation allowances for municipal officials. As an example we may refer to the letter which appears in another column, and a written question [illegible] on the resignation of Mr. E. Purnell Hooley for the purpose [illegible] as Captain in the Sherwood Foresters. In that article we mentioned that a suggestion had been made for the appointment of a *locum tenens*, or a temporary consultant, but that this course had not commended itself to the council. We further expressed our surprise that, having regard to Mr. Hooley's twenty-five years' service, the question [illegible] In this connection a correspondent, "R.D.C. Surveyor," points out that even if superannuation should be granted it will be as an act of grace. Our views on the general question are well known, and it is sufficient for us to say here that we cordially sympathise with the case presented by our correspondent. As he observes, the case is indeed an unanswerable one, and the situation will not be met until the municipal officer becomes absolutely entitled to an adequate [illegible] ing allowance under a compulsory Act of Parliament. The dangers of an optional or adoptive measure are so well known, especially to those who have experience of the ways of small authorities, that compulsion is essential. Only, as "R.D.C. Surveyor" says, let it be soon!

* *

Calculations on Concrete.

By Professor C. W. L. ALEXANDER, Associate M.I.C.E.I.

During the past fifteen years engineering papers have published more figures and calculations relating to cement and concrete than they have given about all other materials and structures put together. Every engineer knows, or fancies he knows, something about concrete. Its use has spread to all kinds of work. These two facts account largely for the attention paid to it in the Press.

Is the average engineer in a position, after these years of super-arithmetic, to turn to a satisfactory table of physical properties and unit strengths when he wishes to get out a design? Is he able to say of cement and concrete, as he would of a certain quality of steel, that its safe stresses in tension, compression and shear, under the conditions given, are so and so? Possibly some engineers, who have standardised their methods and rules, while regularly keeping definite records of tests of samples of cement and concrete, may find themselves in this happy position. But these are few. The writer thinks he is stating a generally acknowledged fact when he says that there is a lamentable amount of confusion in regard to the strength of concrete. Engineers are bewildered by the mass of figures which have appeared, and which, in many cases, vary by several hundred per cent. They want to know what stresses will be safe in a given structure for concrete made according to their specification from materials about whose qualities they have more or less information.

But no statistics are available to give them their requirements, and they must perforce accept some other person's data, without knowing in the least whether or not his materials, &c., are the same. This is the usual procedure, and it is clearly not satisfactory.

It is not the writer's aim to publish any new set of figures to set at rest these troubles, for this is an impossible task. His object is to point out once more the main factors governing the strength of concrete, to show the lines along which these may be measured and controlled, to explain, very briefly, how figures relating to strengths are to be handled, and to indicate how they are affected by the shape and dimensions of the mass, as well as by the method of applying the stress.

Cement testing has been discussed *ad nauseam*, and the only remark one would make is to emphasise the extreme importance of fine grinding and high mortar strength.

The cleanness of the sand is an old topic, but is its importance appreciated? Let it be remembered that the sand is a link between the stone and the cement. If that link is weak, owing to the sand being of a friable nature, or being coated with a film of organic or earthy matter, then the concrete is certain to be of inferior character. Further, a graded sand is essential for dense work.

Much has been written about the large aggregate. The best for this is a clean, hard, well-graded gravel.

The proportions of sand and gravel ought to be regularly determined by (1) the sizes of the particles, (2) the proportion of voids; a record of the amounts passing one and being caught on another standard sieve should be kept, and cubes regularly cast from batches of concrete mixed to stipulated proportions—say, one, three and twelve months. If engineers did this with the materials in their own neighbourhood—and with a set of simple moulds this is a matter of little trouble—they would be able to co-ordinate the data relating to the cement, sand and stone, on one hand, and the finished concrete on the other. There is no other way. It is not practical or sensible to accept figures for a concrete which is made in a way and of materials which are dissimilar to those used by the designer. Hence each engineer ought to prepare his own working stress values. He then knows what he has to rely upon, and he is able to vary or to adjust his ingredients according to the conditions and to the qualities of the materials. Economy cannot be attained otherwise, and it is well to remember that economy includes both reduction in weight and in time required for the execution of the job.

But what limits are to be placed on the extent to which figures obtained from tests of small samples are employed? For example, if a 4-in. cube of concrete stands 1,600 lb. per square at the age of one month, will a similar quality in the compression area of a T beam of a floor bear the same stress? It is safe to say the two will hardly ever bear the same. Tests of specimens, moulded as they are for laboratory purposes, are in the strictest sense only comparative.

They show that a concrete standing 1,600 lb. per square inch is pretty accurately twice as strong as another standing 1,000 lb. per square inch, when the test specimens are identical in dimensions. But a 4-in. cube between the platens of a testing machine is frictionally restrained from bursting—and hence strengthened—and generally will exhibit greater unit strength than a similar mass will show in the body of a floor slab. The engineer bears this in mind when he takes a factor of safety, and is not so foolish as to cherish the idea that unit area in either case is under the same conditions and capable of sustaining similar stresses. It follows, too, that the results obtained from cubes of different size will not give the same unit strengths. If one goes in for systematic testing he must always use a cube or a briquette of the same size. The necessity for this is shown by the figures appended. The contact between the concrete and the machine should be true. This requires properly made moulds, and in compression tests a spherical seat, in case the opposing faces are not truly parallel. It is best to put the concrete directly in contact with the iron platen, for the effect of lead, wood, or plaster-of-paris bedding is quite uncertain.

When these matters have been duly appreciated, one further needs to bear in mind how easy it is to get a stress 100 per cent above the average by a slight eccentricity in the loading. For example, if the load on a column is not axial, the compressive stress on the side carrying the resultant thrust must sustain an unfair proportion. If the nature of the structure is such that cases of this character are likely to occur, allowance must be made in choosing one's working stresses. One gets the necessity for this impressed upon him in testing. If a cube of concrete is inserted so as to bear more on one corner than on the remainder, failure at a much smaller load always results. Should someone send in a cube cast in a bad mould, with a convex or concave face, a similar effect is produced.

It will be seen that, to interpret figures intelligently, one must apportion due weight to each, and that a satisfactory interpretation is only possible when all the contributory factors have been arithmetically measured and recorded.

The writer now submits a few figures which may be of interest to the readers of this paper.

Concrete made December 31, 1913, at University College, Cork.

AGGREGATE.

Whinstone Chippings [from Killeady, Co. Cork —

Size—Over ¾ in., under 1 in.	...	30·4	per cent.
,, ¾ ,, ½		26	,,
,, ½ ,, ¼	...	16·6	,,
,, ¼ ,, ⅛		20·5	,,
,, ⅛ ,, ,,		6·5	,,

Weight—88 lb. per cubic foot.

Voids—45 per cent.

SAND.

A granite sand from Co. Wicklow —

Size—98·5 per cent passed 50 × 50 sieve and practically all was retained on a 76 × 76 sieve.

Weight—Dry, 86 lb. per cubic foot.
Wet, 107½ ,,

(This means that, taking a cubic foot measure full of water, one must pour in 107½ lb. of sand to bring the sand level with the rim, the water meanwhile overflowing.)

Voids—Dry, 46½ per cent.
Wet, 27 ,,

CEMENT.

Messrs. Martin Earle's.

This had been stored for some little time in a

wooden box, and had been slightly affected by damp. It was all put through a ½-in. sieve.

Weight.—When filled quite loose into a bucket it weighed 75 lb. per cubic foot.

Tests on samples of another very good stone of somewhat gave the following interesting figures:—

Dry loose volume	64 lb. per cubic foot
,, well-shaken volume	80 ,,
Wet volume	104 ,,
Voids (say)	38½ per cent.

When mixed with 20 per cent water, rather a large proportion (104 lb. cement + 26 lb. water = 130 lb.), this gave a block whose weight next day was 126 lb. per cubic foot. Hence the finished volume of the mass is about 77 per cent of the light dry volume, and the finished weight of the mass about 121 per cent of the weight of the cement used.

Strength of cement used in concrete.—Six British standard briquettes of cement paste with 22 per cent water and 6 of one of cement mortar (1 cement, 3 Leighton Buzzard sand by weight) gave the following figures:—

Cement Paste.

7 days.	28 days.	6 months.
515	660	730
525	640	635
Average 520	650	683

Cement Mortar.—

7 days.	28 days.	6 months.
150	260	230
160	300	275
Average 155	280	253

The balance of the writer's moulds were not available, else he would have made more specimens.

MIXING CONCRETE.

No attempt was made to proportion the concrete with regard to size of and the voids in the stone, sand and cement. A mixture of 1 : 2 : 4 was made:—

Stone	7·50	cub. ft.	1·00
Sand	3·75	,,	3·25
Cement	1·87	,,	140 lb.
Total, dry	13·125	,,	112·25 ,,
Water	1·71	,,	10·87 ,,
Total, wet			123·00

The above 13½ cub. ft. loose volume of the several constituents, when mixed with 9½ per cent. by weight of water, making a medium concrete and filled into moulds, made 8·15 cub. ft. of concrete as follows:—

6 6 in. × 6 in. briquettes	0·013	cub. ft. each	= 2·58 cub. ft.
4 10 in. × 6 in. × 6 in. prisms	0·833	,,	= 3·33 ,,
17 6 in. × 6 in. × 6 in. cubes	0·125	,,	= 2·12 ,,
6 3·16 in. × 3·16 in. × 3·16 in. cubes	0·018	,,	= 0·11 ,,
6 1 in. × 1 in. briquettes	0·002	,,	= 0·01 ,,
			8·15 ,,

The weight of the dry materials, plus water, was 1,230 lb. This would give 150 lb. per cubic foot (138 lb. of which would be due to stone, sand and cement). But certain amounts of the water get lost in various ways, and the actual weight at one month averaged probably about 144½ lb. per cubic foot. The concrete specimens were removed a week later from the moulds and placed out in the open. The writer ought to explain that he has several special moulds for concrete work.

(*a*) Large steel briquette moulds, similar in shape to those for British standard cement briquettes, but giving an area at the neck of 6 in. by 6 in.

(*b*) Steel column moulds, 40 in. by 6 in. by 6 in., to give specimens for column, beam, and shear tests.

(*c*) Teak cube moulds, 6 in. by 6 in. by 6 in. These are made in combinations of three, one or two sets being sent out to a job, to take three or six castings of the concrete as it goes into, say, a floor.

(*d*) Steel cube moulds, 3·16 in. by 3·16 in. by 3·16 in. These are the Cork standard moulds for cement paste and cement mortar tests, the face of the cube being exactly 10 sq. in. in area, thus facilitating calculations. The writer finds this a very good size of cube.

The subsequent weights and strengths were obtained as follows:—

Weights.

	1 month. lb.	6 months. lb.	12 months. lb.
6 in. × 6 in. × 6 in. cubes	61·75	62·50	62·75
			62·25
12 in. × 6 in. × 6 in. prisms	117·25	117·	118·75
6 in. × 6 in. × 6 in. cubes	18·14	18·84	18·56
	18·88	18·81	18·50
	18·00	18·16	18·44
3·16 in. × 3·16 in. × 3·16 in. cubes	2·72	2·81	2·78
	2·75	2·75	2·75

These gave [illegible] cubic foot at twelve months:—

[illegible]	144 lb.
[illegible]	148 ,,
Small [illegible]	153 ,,

The weights of the prisms are not included, as their exact volume was not determined. It is clear, however, that the larger specimens are less dense than the smaller ones, a fact which must influence the strengths. The weights of the small cubes are very high, due no doubt to their receiving more thorough ramming.

Notice that the specimens show an increase in weight at twelve months over that at the month of some 1¼ per cent. For the month immediately preceding the final tests, the balmy air of Cork was moistened to the tune of 10¾ in. of rainfall, so that the increase in weight is explicable.

Strength [illegible]

	1 month.	6 months.	12 months.
Beams—36 in. × 6 in. × 6 in.			
central load	900	1,200	1,670
Shear [illegible]			
6 in. section	*5,400	22,200	25,800
	*4,850	19,500	24,350
Briquettes [illegible]			
	5,050	7,500	7,950
			8,250
1 in. × 1 in. [illegible]	225	380	440
	190	370	450
Cubes [illegible]			
6 in. × 6 in.	41,850	74,150	101,700
	43,500	73,400	105,000
3·16 in. × 3·16 in.	15,650	24,000	38,100
	16,000	†19,900	36,000

[illegible] below.
† [illegible]

Ultimate Stresses in lb. per square inch.—Stated in round numbers, and inserting approximate figures for the tests noted as unsatisfactory above, these results may be stated as follows:—

Modulus of rupture.	Shear.	Tension. Large briq.	Tension. Small briq.	Compression. Large cube.	Compression. Small cube.
1 months	225 (160)	140	210	1,200	1,660
3 months	350	230	340	2,050	2,490
12 months	420	450	225	2,900	3,780

The absolute magnitudes of these figures are not of any great significance, but their relative values are very interesting. The writer thinks that shearing tests have been given too little attention, and, having now the means of making a thoroughly satisfactory shearing test of a 6-in. by 6-in. section of concrete, he hopes to obtain figures of interest on other mixtures. It is unfortunate that the value of the shear strength at the month can only be surmised.

The so-called "modulus of rupture," as in the case of all non-isotropic bodies, does not possess any real theoretical basis, but it is a useful rough way of effecting comparisons in the case of beams and slabs.

The disparity in the unit strengths in tension between the large and the small specimens is evidence of the direct influence of the dimensions of the test piece and the way in which the load reaches a mass of concrete.

It has been shown by Prof. Coker that the maximum stress intensity in a 1-in. by 1-in. briquette of cement is 1·75 times the average. From the above figures one is led to think that the maximum stress in the large briquettes is from 2½ times (at one month) to 3½ times (at twelve months) the average stress intensity. This shows that tensile tests on large specimens need careful handling and interpretation.

The superiority of the small cubes over the larger

ones may be accounted for to some extent by the greater density obtained in the smaller ones, but the bulk of the difference is unquestionably due to the greater effect of the frictional restraint exercised by the platens of the machine. As has been suggested by other observers, it is probable that the best test would be that in which three cubes were placed together to form a prism and subjected to axial compression, the crushing load on the middle cube being taken at the compressive strength.

As already stated, these figures are given mainly to show the effect of altering the dimensions of the test specimens and to enable a comparison to be made between the ultimate strengths in flexure, shear, tension, and compression. Possibly the other figures relating to the cement, sand and stone may also be of interest. They all indicate the importance of measuring and recording all such particulars if one is ever to be able to prepare a concrete to any stated requirements.

LONDON WORKING-CLASS DWELLINGS.

COUNTY COUNCIL HOUSING MANAGER'S REPORT.

In a memorandum which appears in the annual report of the London County Council for 1913 (Part III.—Public Health), Mr. S. G. Burgess, the housing manager, states that the new buildings opened and completed by the council between April 1, 1913 and March 31, 1914, comprised 236 cottages, providing accommodation for 1,777 persons. Ten sheds and eight shops were also provided, and two three-room cottage flats were converted to two two-room cottage flats. Up to March 31, 1914, a total of 6,420 tenements in block dwellings, and 3,326 cottages, or a total of 9,746 lettings, containing 27,949 rooms, and 1,874 cubicles in lodging-houses, affording accommodation altogether for 57,362 persons, had been provided and opened by the council. The gross rent receivable for the year 1912-13 was £218,925 17s. 10d., and for the year 1913-14, £226,294 11s. 3d., being an increase of £7,368 13s. 5d.

The financial result of the year's working of all dwellings in occupation, after providing for interest and sinking fund charges on the capital expended, is a surplus of £13,623 6s. 6d., which, after adding interest on cash balances (£1,012 5s. 2d.) and the difference between totals of debit charges on cash and stock basis (£3,673 17s. 9d.), gives a total nett surplus of £18,309 9s. 5d., or 8·06 per cent of £227,100 13s. 9d., the gross rental for the year. The interest and sinking fund charges amount to 49·00 per cent of the gross rental. The sinking fund, which will redeem the capital expended on land and buildings within a period of 60 years, has been increased during the year by £17,353 14s. 11d., and the total sum now set aside in this fund in respect of dwellings in occupation amounts to £234,656 13s. The expenditure for the management of the estates, including repairs, rates and taxes, water, lighting, &c., amounts to 39·32 per cent of the gross rental. During the year the sum of £22,972 was transferred to the repairs and renewals account, the unspent accumulations on which, with the interest earned during the year (£4,978 3s. 6d.), now amount to £64,000 2s. 10d. The total addition to the fund was 10·90 of the gross rental.

The loss of rent by empties (including the amounts set aside for the opening of the new buildings, 236 lettings) is equivalent to 3·23 per cent of the gross rental.

A sum of £23,934 4s. 8d. (10·54 per cent of the gross rental) was spent in repairs to the buildings during the year. These repairs include external painting at thirty blocks of tenements and 612 cottages and the entrance doors only, whitening the soffits and cleaning or painting walls of 140 staircases, comb graining and varnishing the woodwork of 1,733 tenements and cottages, and cleansing repairs at 7,191 tenements and cottages. The whole of these repairs were executed by direct labour employed in the housing department.

Institute of Sanitary Engineers.—At a meeting of this body, to be held at Caxton Hall, Westminster, on Wednesday, March 3rd, Mr. G. Bertram Kershaw, M.Am.Soc.C.E., M.Inst.C.E., late engineer to the Royal Commission on Sewage Disposal, will present a paper entitled "Sanitation in the Bermudas: The Drainage of Hamilton, Bermuda." The chair will be taken by Colonel Harland, R.E., C.B.

DANGERS OF TAR-SPRAYED ROADS.

DAMAGES AGAINST DEVON COUNTY COUNCIL.

An important judgment affecting the now almost universal use of tar-spray upon public highways was delivered by Judge Lush Wilson, K.C., at Newton Abbot (Devon) County Court on Friday last. The plaintiff was Mrs. Edith E. Warren, of the Gastwycke Hotel, North Tawton, who claimed £50 from the Devon County Council and Messrs. Fothergill Brothers, Limited, of Exeter, for damages in consequence of alleged personal injuries sustained by being thrown out of a trap, due, it was alleged for the plaintiff, to the defendants' negligence in tar-painting a part of the road between Newton Abbot and Teignmouth. At the previous hearing evidence was given that the tar was spread upon a hill having a stiff gradient, and that plaintiff had to have medical attendance for a considerable time after the accident. Some stone or gravel had been placed upon the tar, but it was alleged that this was insufficient to prevent horses slipping, the gravel being too coarse for the purpose. The road surveyor's opinion was that the road was left in a condition suitable for traffic. Mr. J. H. Hutchings appeared for the plaintiff, and Mr. M. J. McGahey for the defendants.

Giving his judgment, his Honour said it was alleged that the road was rendered dangerous. It was proved that the road was more or less hilly, and in June or July the contractors were laying down tar. In accordance with their usual custom, they had tarred half the road on one side. There was a conflict of evidence whether the tar was spread in a proper manner. It was alleged that insufficient chippings were spread, and that too much tar had been spread. Although in one technical matter, the size of some of the chippings used, there was a departure from the general directions and specifications, the work was substantially carried out in accordance with the general directions of the Road Board. He did not find negligence up to the point of the completion of the work done by the defendants. Subsequently witnesses showed that the road was slippery and dangerous, while expert witnesses told him that the work was well done. Sand or gravel had been thrown over the surface of certain hilly parts. He was of opinion that on July 3, 1914, the surface of the hill and of other parts of the road in question was in a slippery and dangerous condition for the use of the public, and such a condition would have been avoided if the defendants had performed an operation of sprinkling sufficient sand or gravel on the tar after it had sufficiently dried, and before they invited the public to use the road. It was clear that no action of this nature could lie against a road authority for what was known as nonfeasance; it must be proved that it amounted to misfeasance. The Judge said he had come to the conclusion that where a road authority altered a highway, and injury was occasioned to an individual by such alteration, the breach of duty on the part of the authority was misfeasance. He should therefore give judgment for the plaintiff for £40.

Mr. McGahey thought this was clearly a judgment against the county council. His Honour had held that the contractors finished their work, and left the road in a proper condition.

The Judge said that, so far as the specifications of the Road Board were concerned, the work was carried out properly. Before the road could be made safe, and the public invited on it, sand should have been sprinkled so as to provide a foothold for horses.

Mr. Hutchings said he was content to take judgment against the county council.

By consent his Honour then altered his judgment as only against the Devon County Council. Costs were granted on Scale C.

A stay of execution was granted for fourteen days.

Public Authorities and Enemy Firms.—From a report of a committee of the London County Council specially appointed to investigate the question, it appears that there are no fewer than twenty-eight alien enemy firms to whom the London County Council has been in the habit of giving orders. These firms have now been placed on the council's black list of firms from whom goods shall not be obtained. A correspondent asks whether the names of these firms cannot be made public. Such a course, he suggests, would not only be generally informing, but render a special service to those municipal and other public authorities who have this question under consideration.

London Street Pavings.

METROPOLITAN COMMITTEE'S TWELFTH ANNUAL REPORT.

The Metropolitan Paving Committee, of which Mr. Vigo G. Morton is chairman, have issued their twelfth annual report relative to the paving works carried out in the County of London by various local authorities, compiled from information which has been furnished by the engineers to the various authorities concerned. The committee was formed as the result of a conference of representatives of the metropolitan borough councils held at the Westminster City Hall on January 8, 1903, for the purpose of considering the general question of materials and methods for the streets of London.

The information furnished in the returns on which this report is based relates to practically all the best-known descriptions of paving, the method of laying, the period the paving has lasted, cost of laying, [illegible] and other details.

The chief features of the year's return may be correctly summarised as follows:—

Description of Pavers Laid.—The returns received by the committee are noteworthy for the variety of the kinds of paving laid down during the year under review. Practically every kind of paving has been used, some in large quantities. As in the past year, creosoted yellow deal supplies the largest quantities. In Fulham and Hammersmith in particular very large areas of bituminous macadam were laid down, and in Hampstead and St. Marylebone a number of streets were treated with tar-slag macadam. Large areas of main roads in Hammersmith and Wandsworth were laid with creosoted deal, while in Woolwich a large area of Durax granite cubes is the predominant feature. Sectional Jarrah, Aberdeen granite setts, rock asphalt, Lithofalt blocks, and varieties of asphalt macadam were also used in considerable quantities in different boroughs. Several miles of roads, especially in the outer boroughs, such as Wandsworth, have been tar-sprayed.

Foundations.—The tendency appears to be to increase the thickness of concrete foundation, owing, doubtless, to the altered conditions of the traffic in London streets. Various thicknesses have been used, ranging from 6 in. to 15 in.

Saving in Tar-sprayed Roads.—As pointed out in previous reports, the system of tar-spraying macadam roads has largely increased, with the result that an appreciable saving in the cost of scavenging and watering has resulted in those boroughs where its use has been extensive.

The committee desire again to point out that their work, as mentioned in previous reports, is confined to collecting and assimilating information relative to the paving materials and methods of paving which have been adopted in London under varied circumstances, and no attempt is made by the committee to regulate the description of paving which should be used.

The returns sent in during the past year have been put in tabulated form, and may be briefly summarised as follows:—

FULHAM.

Very large areas of bituminous macadam were laid in Fulham during the year under review. On new streets the material was laid to a depth of 2½ in. on a granite foundation, 12 in. thick, finished with 1-in. to 1½-in. topping; in some cases the surface was finished with liquid bitumen and granite chips. In the case of relays the bituminous macadam was laid to a depth of from 2½ in. to 3½ in., including topping, the old macadam with which the street was formerly paved being taken up and carted away, afterwards treated with tar and bitumen, and relaid to a depth of from 2 in. to 3 in., and finished with 1-in. to 1½-in. asphalt topping, the whole being laid on an existing foundation of hardcore. The initial cost of laying this bituminous macadam in the new streets varied from about 5s. 6½d. to 7s. 7d. per yard super. with foundation, and in the relaid street the average cost per yard super. without foundation was about 4s. 9½d., this cost being inclusive of the preparation of the road surfaces, which in several cases has been considerable.

A comparatively small area of creosoted deal blocks, 8 in. by 5 in. by 3 in., were laid, close jointed, grouted in with pitch and cement on an existing concrete foundation at a cost of about 8s. 8d. per yard super. with foundation, the work being carried out by the borough council. The creosoted deal which this paving replaced had been down about eight years.

The borough engineer and surveyor, Mr. F. Wood, states that the annual cost of maintenance of softwood roads is about 4·22d. per super. yard—*i.e.*, if certain repairs have been made in a road, the cost of these repairs is spread over the total paved surface of the road. If the cost was spread over the total wood-paved area of the roads, the cost per square yard would be 3·22d. per super. yard. In Fulham the cost [illegible] over that of previous years. This, in Mr. Wood's opinion, is due to the heavier and self-propelled traffic, which very rapidly discovers the weak parts of the paving, and which, if allowed to continue unrepaired, would develop into serious depressions, and at the [illegible] to the foundation. The policy in this borough, therefore, has been to carry out these repairs as soon as they appear, which involves extra cost; but this increased cost is more than compensated for, as a record of the wear of the timber indicates that the life of the timber is extended at least 20 per cent to 25 per cent. This increased life is possibly accounted for by the growing use of rubber tyres that are of a softer material than the timber forming the road surface, and the reduction of horse traffic. Mr. Wood states in this connection that, from a census of the traffic that has been taken, the weight of the traffic is 45 [illegible] Fulham-road alone.

Mr. Wood points out that the tar-spraying of the roads and the adoption of the method of asphalt [illegible] able change, and shows a considerable saving in the scavenging work of the borough. The amount of street refuse collected in 1906-7 was 14,189 tons. As the collection and cartage of this now amounts to about 2s. 6d. per ton and 2s. 11d. per ton for the shoot, it is evident that, if the grit which forms part of the refuse can be kept in the road by some other means than has been the case in the past, the road will improve by lasting longer, and the scavenging bill will materially decrease. Since tar-spraying and the adoption of asphalt macadam have been resorted to, the results obtained during the past four years have been very satisfactory, as last year the amount of refuse collected was 8,275 tons and this year 7,029 tons, or a reduction of about 50 per cent from 1906-7, equal to over £1,900 per annum. As this saving has every appearance of being permanent, the capital value it represents is at least £50,540. The Fulham Borough Council has abandoned ordinary water-bound macadam construction, and adopted bituminous macadam (Trinidad Lake bitumen) with great advantage. The scavenging of each road in the borough is now done once daily at no greater annual cost than before.

GREENWICH.

In Charlton-road in this borough an area of compressed asphalt, 1½ in. thick, was laid down on a 6-in. Portland cement concrete foundation at a cost of 13s. 3d. per yard super., including excavation, foundation and asphalt. This thoroughfare was previously laid in granite water-bound macadam.

HAMMERSMITH.

Large areas of main roads in Hammersmith were paved with creosoted deal, and a considerable quantity of bituminous macadam was laid in the lesser thoroughfares.

The creosoted deal 8-in. by 5-in. by 3-in. blocks were laid with close joints run in with a mixture of boiling pitch and creosoted oil, grouted with Portland cement, and sanded with a layer of ¾ in. pea gravel, the foundation of Portland cement concrete varying in depth from 8 in. to 12 in. The initial cost of laying this softwood per yard super. varied from 13s. 5d. to 15s. 4d. with foundation, and 7s. 9d. to 8s. 6d. without foundation. It appears from the returns that Jarrah and creosoted beech laid in Goldhawk-road—a heavy trafficked street—in 1898 lasted fifteen and a-half years, and that 1½-in. compressed asphalt laid in Norland-road in November, 1903, lasted ten years. Some paving—presumably creosoted deal laid in 1895 in King-street, a street carrying heavy traffic—has

[illegible] eighteen years. The wood paving was in each case laid by a contractor.

The foundation of macadam was laid from 4 in. to 6½ in. deep on a foundation of old macadam. The paving material in one case consisted of a bottom layer 3 in. thick of old macadam treated with Trinidad Lake asphalt, and finished off with a top layer of Trinidad Lake asphalt 1 in. thick. In another case the paving material consisted of a bottom layer 3 in. thick of old macadam treated with Plascom, and finished off with a top layer of new granite and Plascom 1½ in. thick. The rest of the bituminous macadam consisted of a bottom layer 3 in. thick of old macadam treated with Traverite, finished with a top layer of 1½ in. thick of new granite and Traverite, and ¾-in. granite chippings on surface. The bituminous macadam was laid by the borough council, and the cost varied from 4s. 1½d. to 6s. 3d. per yard super. without foundation. Approximately, 298,443 super. yds. of roads were tar-sprayed, at a cost of £1,028, and Mr. Mair, the surveyor, says that there has been a material increase in the cost of sweeping and watering since the adoption of tar-spraying.

HAMPSTEAD.

In Hampstead creosoted deal blocks, 9 in. by 3 in. by 4 in. and 9 in. by 3 in. by 5 in., were laid, with close joints run in with pitch and creosote oil, and grouted with Portland cement and sand on concrete foundations, varying from 8 in. to 9 in. in depth, at a cost per yard super. of from 6s. 8d. to 8s. 4d. without foundation and from 8s. 9d. to 11s. 10d. with foundation. This paving replaced Jarrah blocks which had been down from ten to thirteen years, creosoted deal blocks which had lasted eleven years, and granite setts which had been down ten years. In most cases the foundation was prepared by the local authority, and the wood paving carried out by a contractor who maintains the wood under contract.

Some Durax paving was laid in Besse-road, an important thoroughfare, the material being laid 3¼ in. depth of stones on ¾-in. tarred chippings, and grouted in with tar, at a cost of 5s. 10d. per yard super. without foundation. In Abbey-road, Lithofalt blocks 9 in. by 4½ in. by 2 in. were laid with close joints and grouted with Portland cement and sand, the blocks being laid immediately after the floating is applied. The cost of this Lithofalt paving was 8s. 9d. per yard super. with foundation, and it replaced Jarrah blocks which had been down for thirteen years.

Asphaltic macadam was also put down. This material consisted of broken granite, sharp sand, and [illegible] with Trinidad bitumen, spread over the surface while hot, and is raked over with hot iron rakes, and then compressed by steam roller. It is sealed with refined Trinidad bitumen squeegeed over the surface, and afterwards covered with small granite chippings. The cost of this asphaltic macadam per yard super. was 6s. with foundation and 5s. 9d. without foundation, this price including the preparation of the surface by the local authority, and the maintenance of the macadam for five years by the contractor.

Tar-macadam, 4½ in. in depth, was also put down at a cost of 3s. 6d. per yard super. with foundation, the work being carried out by the borough council.

HOLBORN.

A variety of different kinds of paving were laid in Holborn. In Old North-street, a residential thoroughfare, Roadamant bituminous carpet 1½ in. thick was laid on a foundation of old granite setts at a cost of 9s. 6d. per yard super. without foundation.

Besides several small areas laid in creosoted deal blocks, a large area of these blocks, 3 in. by 8 in. by 5 in., was laid in Alfred-place, a commercial thoroughfare. These were laid in bituminous grout on a 6-in. foundation, at a cost per yard super. of 11s. 3d. with foundation and 7s. 6d. without foundation.

In Gray's Inn-road a large area was laid in Acme sectional Jarrah blocks, 3 in. by 8½ in. by 3¾ in., bituminous grout on Portland cement concrete, the average depth of which was 15 in., at a cost per yard super. of 17s. 5d. with foundation, and 11s. 9d. without foundation. The work was done by a contractor, and the annual cost of maintenance per yard super. is given at 10d. Similar blocks laid on a 12-in. foundation cost the same, but the annual cost of [illegible] by 9 in. by 5 in., were put down in John-street, laid in bituminous grout on an old concrete foundation repaired, the work being carried out by the borough surveyor, at a cost of 16s. 8d. per yard super. with [illegible] given as 3d. per yard super.

Compressed rock asphalt, 2 in. thick, was laid, compressed with heated pilons on a 9-in. Portland cement concrete foundation, at a cost per yard super. of 14s. 6d. with foundation and 10s. without foundation. Some asphalt macadam, "pouring-in system," laid 3 in. deep in Guernsey granite 1½-in. gauge, grouted with asphalt and bitumen, on a foundation of hard core, &c., was laid at a cost per yard super. of 7s. 2d. [illegible]

In Red[illegible]-street, [illegible] "Jacksid" macrete granite blocks, 9 in. by 9 in. by 4½ in. These were laid in Portland cement grout on a 12-in. Portland cement concrete foundation, at a cost of 13s. 6d. per yard super. without foundation, the annual cost of maintenance being 3d. per yard super. In New Oxford-street (north side by Tottenham Court-road) fine dressed granite setts, 5 in. by 4 in., were laid in Portland cement concrete on a foundation the average depth of which was 9 in., the work being carried out by the borough council, at a cost of 35s. per yard super. with foundation.

ROYAL BOROUGH OF KENSINGTON.

The greater part of the paving laid in this borough consisted of creosoted wood blocks, 8 in. by 4 in. by 3 in., 8 in. by 5 in. by 3 in., and 8 in. by 4½ in. by 3 in., laid, grouted in tar, pitch and cement, on a 6-in., and in one case on a 12-in., Portland cement concrete foundation, the cost of laying per yard super. varying, for the paving on the 6-in. foundation, from 7s. 2d. to 8s. 10½d. without foundation, while that on the 12-in. foundation cost 14s. 6½d. per yard super. with foundation.

Some Kensington asphalt clinker blocks were also laid, but particulars of the cost are not given. A [illegible] was laid on 8 in. of concrete, at a cost per yard super. of 9s. 6d. with foundation.

CITY OF LONDON.

Most of the paving laid in the City consisted of stone in the form of Aberdeen granite setts. These 3 in. by 6 in., 5 in. by 4 in., and 4 in. by 6 in. setts were laid in cement grout on a 9-in. Portland cement concrete foundation, except in one case, where the setts were on a 6-in. foundation. The cost of the new 3-in. by 6-in. setts was 19s. 3d. per yard super. with the 9-in. foundation, and 16s. 3d. without foundation, the cost of the redressed setts on the same [illegible] without foundation.

Natural rock asphalt comes next from the point of view of quantity laid down. This material was laid 2½ in. deep, compressed in situ on a 9-in. Portland cement concrete foundation, at a cost per yard super. of 15s. 3d. with foundation and 9s. without foundation, plus 1s. 5d. credit for old asphalt. The annual cost of maintenance for the asphalt laid in Coleman-street is 9d. per yard super., while the cost of maintenance of that laid in Fenchurch-street is 1s. 3d. [illegible] which had been down thirty-one years in Coleman-street and eighteen years in Fenchurch-street.

A large area of creosoted deal blocks, 7 in. by 3 in. by 5 in., were also laid, the joints being filled in with a boiling mixture of pitch and oil, and in the case of [illegible] strips, 1½ in., were inserted between every fifth course, laid angularly about ½ in. above the surface of the wood blocks. This latter paving was laid on a 9-in. Portland cement concrete foundation, at a cost of 15s. 5d. per yard super. with foundation, and 10s. 4d. without foundation, the annual cost of maintenance per yard super. being 10d. The cost of the ordinary creosoted deal paving laid on a 6-in. existing Portland cement concrete foundation was from 9s. 1d. to 9s. 5d. with foundation, and 7s. 9d. to 8s. 7d. without foundation, per yard super., the annual cost of maintenance varying from 9d. to 1s. 5d. per yard super.

LONDON COUNTY COUNCIL.

The return from the London County Council deals with paving works carried out by that council in Hackney and Islington, the materials used being sectional Jarrah, sectional Acme paving, creosoted deal and Aberdeen setts. The sectional Jarrah was laid in bitumen, the creosoted deal in pitch, and the [illegible] concrete foundation. The cost per yard super. of the sectional Jarrah was 16s. 3½d. with foundation and 12s. 6d. without foundation; of the creosoted deal,

15s. 10½d. with and 11s. 6d. without foundation, and of the Aberdeen setts, 19s. with and 15s. 4d. without foundation.

ST. MARYLEBONE.

This borough has continued itself both to wood pavement and renewals, exclusively to 5-in. by 3-in. by 9-in. creosoted yellow deal blocks, of which they laid over 22,000 super. yds. These were laid close-jointed, and grouted with pitch and creosote oil. The new paving was laid on a 12-in. cement concrete foundation by the borough council with direct labour at a cost of from 18s. 9½d. to 19s. 6d. per yard super. with foundation. The renewals were laid in the same manner, on foundations of varying thickness, at a cost of from 9s. 10½d. to 10s. 1½d. per yard super. without foundation. Considerable tar-spraying was done, 80,430 super. yds. of roads being so treated at a cost of £678 5s. 10d., while very large areas were laid in tar-macadam.

The tar-macadam was laid bedded on an old macadam foundation to a depth of 4½ in., when finished, in two coats, the bottom coat 2½-in. gauge 3 in. thick, the top coat 1½-in. gauge 1½-in. thick, the work being carried out by contract at a cost verying from 4s. 11d. to 5s. 3d. per yard super. without foundation.

WANDSWORTH.

In streets with an easy gradient this borough has laid creosoted softwood blocks, 8 in. by 3 in. by 5 in., dipped in a mixture of tar and pitch, and grouted with Portland cement mortar on a 9-in. Portland cement concrete foundation. The work was carried out by a contractor for a lump sum, the price in the schedule attached to the contracts being from 14s. 8d. to 14s. 10d. per super. yard, with foundation, for extra work. Wandsworth has carried out a great deal of tar-spraying, costing per super. yard for first-coat work, grit 1¼d., granite chips 1¾d., second-coat work 1d. The surveyor, Mr. Dodd, states that the decrease in the cost of scavenging for the year ended March 31, 1914, compared with the year ended March, 1907, when no tar-spraying was done, was no less than £10,194, while the decrease in the cost of watering was £7,051, and the decrease in the loads of slop and sweepings removed 35,989.

When the gradient has been heavy—1 in 15 to 1 in 23—Aberdeen granite setts, 3 in. by 6 in., were laid, rammed and grouted with Portland cement mortar on a 9-in. Portland cement concrete foundation, the work being done by a contractor for a lump sum, the price in the schedule being 13s. per super. yard for extra work.

WOOLWICH.

Various kinds of asphalt, softwood and Durax granite cubes figure in the return from Woolwich.

The 7-in. by 3-in. by 5-in. creosoted softwood blocks were laid in pitch on a 9-in. Portland cement concrete foundation. No floating was used, the concrete being worked to a smooth surface. The foundation was laid by the local authority, the wood paving being carried out by contractors under one year's maintenance contract, at a cost per yard super. of 14s. with foundation and 6s. 6d. without foundation.

In Eltham-road a very large area of Durax granite cubes, 3 in. by 4 in., were laid in 8 to 10 cement mortar, the machine-cut cubes being in intersecting segmental courses on a bed of ¼-in. tarred chippings, rack-up joints, consolidated by steam rolling, grouted with boiling pitch and surface-blinded with granite chippings before the pitch has solidified, the existing macadam roadway being excavated to the required depth, and the foundation consolidated by steam rolling. The cost of this Durax paving was 8s. per yard super. with foundation, the work being carried out by contractors under a five years' maintenance contract.

Bradshaw's rock asphalt carpeting, 1½ in. deep, was put down in two layers, at a cost per yard super. of 7s. with foundation and 6s. without foundation. Val de Travers natural asphalt macadam was laid, consisting of 4 in. of 2-in. Guernsey granite, the interstices being filled with natural asphalt matrix covered before cooling with granite chippings and consolidated to 3 in. thick with a 10-ton roller, at a cost per yard super. of 8s. 5d. with foundation and 7s. 6d. without foundation. "Roadamant" patent asphalt carpeting was laid 1 in. deep, in one layer, at a cost per yard super. of 7s. 3d. with foundation and 5s. 11d. without foundation.

CITY OF WESTMINSTER.

This return deals with two streets which are stated by the city engineer to be typical of the paving works executed by the Westminster City Council. Grosvenor-road was laid in softwood blocks, 3 in. by 8 in. [illegible] per cubic foot, laid, pitch-grouted, on an 8-in. Portland cement concrete foundation, the work being done by a contractor under a twelve months' maintenance contract, at a cost of 14s. 6d. per yard super. with foundation and 8s. 6d. without foundation.

Craig's-court, a highway with very little traffic, was laid in natural rock asphalt, 2 in. thick, on a 9-in. Portland cement concrete foundation, at a cost per yard super. of 13s. 10½d. with foundation, including excavation, and 8s. without foundation.

The city engineer expresses the opinion that tar-spraying generally tends to reduce the cost of scavenging [illegible]

The committee append to their report a return compiled from information supplied to them by the officers of the City of London and fourteen metropolitan boroughs giving the mileage of the different kinds of paving and materials used, &c., as existing in the years 1910 to 1913, and the tonnage of slop removed.

A similar return was published last year in respect of the years 1910, 1911 and 1912, and the figures for the year 1913 have been added so far as they have been [illegible] decrease in the quantity of slop removed in those boroughs where there has been an increase in the mileage of tar-sprayed and asphalt macadam roads. In Fulham, for example, where the mileage of asphalt macadam roads has increased from 2 in 1910 to 9 in 1913, the tonnage of slop removed has gone down from 9,038 in 1910 to 7,029 in 1913. The amount of street refuse collected in this borough in 1906-7 is stated to be 14,189 tons, and the reduction is attributed, to a large extent, to the tar-spraying of the roads and the adoption of asphalt macadam construction. The Royal Borough of Kensington also shows a marked decrease in the quantity of slop removed. In [illegible] sprayed since 1910, and the quantity of slop removed has fallen from 24,694 tons in the year named to 18,515 tons in 1913. In the borough of Wandsworth, where the mileage of tar-painted roads has increased from 37 in 1910 to 106 in 1913, the number of loads of slop removed went down from 55,810 in 1910 to 32,414 in 1913. Compared with the year ended March, 1907, when no tar-spraying was done, the decrease in loads of slop and sweepings removed for the year ended March, 1914, in this borough is stated by the borough engineer to be 35,989.

Generally speaking, there has been a decrease in all boroughs in the amount of slop removed, and this is probably due, to some extent at least, to the reduction in horse traffic, apart from the causes above referred to.

The committee also append to their report a return showing the cost of maintenance, &c., of the roads in the City of London and various metropolitan boroughs. The expenditure under the first item—*(a)* Maintenance (including new paving works), Repair and Improvement, of course, varies from year to year according to the number and importance of the streets repaved. Generally speaking, there has been a slight increase in the amount expended under this head as compared with the previous year, although in a few instances there was an appreciable reduction.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 3s.). Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

New Swing Bridge at Dalmuir. One of the two swing bridges constructed over the Forth and Clyde Canal at Dalmuir was formally opened recently. The necessary powers for the construction of the bridge were obtained by Clydebank Town Council in 1901, and the order was transferred to the Glasgow Corporation on lease for forty-two years for the purposes of the corporation tramway system. The bridge consists of a single-swing span, constructed of steel with the necessary concrete foundations. The roadway is 20 ft. wide, and there are 5 ft. footpaths. A double line of tramways has been laid on the roadway, and the Glasgow cars, which at present only go as far as the east side of the canal, will in future run on to the western boundary of Clydebank. The laying of the tramways across the new bridge at Dalmuir gives a continuous tramway route from Glasgow to Loch Lomond. Messrs. Crouch, Hogg & Easton, Glasgow, were the engineers, and the bridge was constructed by Messrs. Robert McAlpine & Sons.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

COUNCIL MEETING.

At a meeting of the council of the Institution of Municipal and County Engineers held at 92 Victoria-street, Westminster, on Saturday, the 6th inst., there were present Messrs. J. S. Pickering (president, in the chair), J. Patten Barber, W. N. Blair, J. A. Brodie, J. S. Brodie, Chas. Brownridge, G. F. Carter, E. J. Elford, Frank Harris, T. W. A. Hayward, E. B. Martin, F. Massie, P. H. Palmer, W. H. Prescott, Norman Scorgie, W. Stubbs, R. J. Thomas, H. T. Wakelam, O. E. Winter, the consultant secretary, and the secretary.

CONGRATULATIONS.

It was resolved to offer the congratulations of the council to Mr. N. Scorgie (Hackney) on being elected to the office of president of the Society of Engineers.

THE MEMBERSHIP ROLL.

The following candidates were elected

Members: Messrs. D. H. Brown, chief assistant to county surveyor, Durham; R. E. Ford, deputy borough surveyor, Doncaster; W. H. Lewis, chief assistant engineer and surveyor, Wembley Urban District Council; and E. Potts, chief assistant to borough engineer, Rotherham.

Associate-members: Messrs. P. H. Audsley, building and drainage surveyor, Dewsbury; J. H. Gregson, engineering assistant, Town Hall, Bolton; and T. C. Humphreys, chief assistant engineer, Festiniog Urban District Council.

Student: Mr. H. Kellett, articled pupil to borough engineer and surveyor, Douglas, Isle of Man.

LETTER OF CONDOLENCE.

It was resolved to send a letter of condolence to the relatives of the late Mr. W. Bell, county road surveyor, Aberfeldy.

BROKEN STONE AND CHIPPINGS.

A letter was received from the Engineering Standards Committee with reference to the Standard Specification for Broken Stone and Chippings, and especially with regard to the excessive lengths of stone.

It was decided to inform the committee that the council do not consider it desirable to specify any particular stone as exhibiting the deficiency referred to, and to point out that it is not only the cleavage of the stone or its character, but also the method of breaking which results in stones of excessive lengths.

UNEMPLOYMENT INSURANCE.

Unemployment of Road Workmen.—The decision of the umpire with regard to the payment of contributions in respect of unemployment of road workmen was received as follows:—

> On the facts before me my decision is that contributions under Part II. of the National Insurance Act, 1911 (Unemployment Insurance), ARE payable in respect of workmen employed wholly or mainly in re-surfacing existing roads where it is necessary to relay or to strengthen the foundations, including laying for the first time, or relaying, concrete underlying wood, stone, brick, asphalt, &c., but excluding:
>
> (1) Putting a thin layer of concrete over existing concrete merely for the purpose of smoothing the surface or of adjusting the level.
>
> (2) Reinstatement of the roadway solely in connection with repairs to mains or to tramway lines.
>
> (3) Work in connection with isolated patching or to isolations.
>
> (This decision modifies any previous decision with which it may be in conflict.)

It was resolved to inform the umpire that the council are of opinion that the award is not sufficiently explicit, and will be found difficult to follow in practice.

NATIONAL GUARD.

A letter was received from Mr. W. Noble Twelvetrees with reference to the formation of a corps of engineers as a technical branch of the National Guard. It was resolved to inform Mr. Twelvetrees that the council will be glad to assist the movement in any way they can.

LONDON SANITARY COMPANY.

The president reported information which he had received with regard to the work of the London Sanitary Company, and it was resolved to insert the following notice in the next *Journal*:—

> Recruits for London Sanitary Companies.
>
> It having come to the knowledge of the Council that the work with the Expeditionary Forces for which the above companies are being formed may not be appropriate to the attainments and professional standing of recruits drawn from the offices of municipal and county engineers, it is suggested that members of the institution should, before joining, make inquiries as to the work they may have to perform. In case of any doubt it will be desirable to communicate with the War Office or some reliable agency.

STANDARD BITUMINOUS COMPOSITION FOR SPECIAL JOINTS ON STONEWARE PIPES.

The question of instituting a standard composition for special joints having been brought to the notice of the council by Mr. T. J. Moss-Flower, it was resolved to ask the Sectional Committee of the Engineering Standards Committee to consider this question at an early date.

HOUSING SCHEMES.

A letter from the Town Planning Institute enclosing a copy of the memorandum to the Presidents of the Local Government Board and the Board of Agriculture on the subject of housing schemes was considered, and it was resolved to inform the Town Planning Institute that the council are of opinion that the suggested average of twelve houses per gross acre, while desirable in undeveloped districts, will, in many cases, be found to be impracticable.

It was also resolved to draw attention to the apparent error involved in the statement that twelve houses per acre is the highest average adopted in the Quinton and Harbourne town planning scheme.

TOWN PLANNING SCHEME CONFERENCES.

It was resolved to appoint representatives to confer with representatives of the Surveyors' Institution with the object of drawing up a memorandum calling attention to the desirability of conferences between municipal engineers and surveyors or agents of landowners in connection with the preparation of town planning schemes.

HOUSING AT COLWYN BAY.

L.C.B. AND THE PRICE OF BUILDING MATERIALS.

The Local Government Board recently addressed a letter to the Colwyn Bay Urban District Council asking what they were doing in the way of providing dwellings for the working classes. An estate at Llandrillo has been purchased for such dwellings, and the council have prepared a scheme for the provision of a large number of houses; but, owing to the war's effect on prices and on the value of money in the market, they have for the present refrained from asking for tenders for the erection of the buildings. A reply to this effect was sent to the Local Government Board.

The Local Government Board have now written as follows:

"There has generally been a tendency to overestimate the increase in the cost of building cottages due to the rise in the price of certain materials, such as timber. As the cost of such materials forms only a small percentage of the total cost of a cottage, an allowance of 2½ to 5 per cent per cottage should, in ordinary circumstances, cover any such increase. In view of the need for further houses disclosed at the inquiry, it appears to the board that the scheme should be carried out without delay."

Mr. E. Allen said it was absolute nonsense to say that 2½ to 5 per cent represented the increased cost of building. It was more like 15 to 20 per cent.

Mr. J. T. Taylor: It is 60 per cent in some cases.

Mr. Allen: Very absurd letters come from these public [illegible] at the present time.

Institution of Civil Engineers. At the next meeting Mr. H. E. Yerbury, M.Inst.C.E., will submit for discussion a paper entitled "The Electrolytic Action of Return Currents in Electric Tramways on Gas and Water Mains, and the Best Means of Providing against Electrical Disturbances." The chair will be taken at 8 p.m.

A Glossary of Road Terms. By H. Percy Boulnois, M.Inst.C.E. St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C. Price 2s.—Mr. Boulnois has achieved far more than he may imagine by this production of his pen. He set out to standardise the nomenclature of road terms; in addition he had made a valuable addition to English literature. To the untutored it is like reading a new language; Mr. Boulnois says it isn't anything like "complete." At any rate, it is a valuable *vade mecum* which no one has attempted before.—*Portsmouth Times.*

The Purification of Brewery Wastes.—(V.)

By G. BERTRAM KERSHAW, M.AM.SOC.C.E., M.INST.C.E., Late Engineer to the Royal Commission on Sewage Disposal.

Brewery wastes are met with in most country towns, and often give rise to trouble from smell, either in the sewers of the town itself or at the sewage works, where the mixed sewage and brewery wastes are dealt with.

Very briefly described, brewing consists in obtaining a solution of sweet [illegible] malt. Hops are added to the wort, which is next boiled. After cooling the liquid is fermented with yeast, resulting in the production of beer.

Malting is often carried out on the brewery premises, and consists in steeping barley in water for a certain period after which the grain is placed on floors to germinate, or sprout, [illegible] It is afterwards dried. The soaking process may be brought about either by placing water continuously through the tanks in readiness in which the grain is steeped, or, alternatively, by quiescent soaking—i.e., successive filling and drawing off of water from the grain tanks.

Brewery wastes absorb oxygen very greedily, and they are difficult to treat satisfactorily by themselves, while, when mixed with sewage, the treatment of the combined liquid is by no means always an easy matter, especially if the brewing wastes predominate.

The mixed wastes from a brewery often take up as much as 60 parts per 100,000 of oxygen from permanganate in four hours at 80 deg. Fahr., while the solids both in solution and in suspension are usually very high.

The chief point to be borne in mind is that the wastes should, if possible, never be permitted to develop acidity, and it is for this reason that lime is so frequently employed in dealing with this particular waste.

Quite apart from nuisance at the sewage works, wastes from breweries may cause trouble in town sewers, especially where the gradients are slack and junction manholes [illegible] bad spots being often noticeable in the streets, particularly in hot, close weather. Occasionally openings in manhole covers and vent pipes may be seen quite whitened with sulphur derived from the sulphuretted hydrogen given off.

The drains of an old brewery are often found on examination to be faulty and badly laid, liquid lying in them and [illegible] at the end of the week.

It is questionable whether brewery wastes should not, in certain cases at all events, receive preliminary treatment at the brewery before they are discharged to the sewers. Certainly this would be the best way of preventing local nuisance from manholes, vents, gullies, &c.

It is often assumed that the comparatively clean-looking steep waters derived from maltings are innocuous. As a matter of fact they are usually quite about as strong organically as a domestic sewage of average strength. They encourage dense growths of fungus in rivers and streams, and they should always be properly treated before discharged into any stream.

Nearly all the waste liquors from a brewery are more or less polluting, with the exception of attemperating and refrigerating water, which is practically clean water, and can be treated as such.

The worst waste liquid from a brewery is undoubtedly that derived from the cask and bottle washing department. Hot water and steam is used during this cleaning process, and the waste liquor is made up of stale beer, spent hops, moulds, gummy matter, dirt, &c., diluted with water. Such a liquid naturally becomes offensive very rapidly, especially if the empty barrels have been much exposed to the sun, and if retained for any length of time it becomes extremely acid. Permanganate of potassium and bisulphide of calcium are frequently employed to cleanse the casks.

Turning to the volume of wastes produced, these will vary somewhat in different breweries, and also in the same brewery at different times of the year, as an approximation, it is probably from two to five times the volume of the beer brewed.

Careful observations in the case of a brewing plant producing both light and heavy beers, with a capacity of some thirty-five quarters, have shown that on an average some 4,000 gallons of waste liquor are produced per twenty-four hours.

Malting is not carried on contiuously throughout the year; consequently at certain times the waste waters from this source are absent.

Again, refrigerating and attemperating waters may either be allowed to mingle with the rest of the wastes or they may be discharged separately, and in hot seasons larger volumes of water will be required than in cold. Accordingly, the general waste liquors will be diluted, or the reverse, as the case may be.

The [illegible] this may depend somewhat upon the nature of the trade done, accordingly as large or small casks are [illegible] steep water in the malting season. "Square" water and washings from the yeast backs, floors and fermentation squares generally come next in point of volume, while washings from the brewing vessels are usually comparatively small in volume. Other waste liquids come from the drainings from grain, [illegible]

It may be as well to take a few instances where brewery wastes have caused pronounced trouble.

At Burton-on-Trent, where nearly 70 per cent of the sewage they [illegible] per twenty-four hours—consists of refuse liquor from breweries, the sewage is treated on a sewage farm some [illegible] many years, having been originally recommended by Prof. Dewar. The dose of lime given is extremely heavy, amounting to some 57 parts per 100,000.

Previously to the adoption of lime treatment very great nuisance from smell had been caused by the fermentation of the brewery wastes in conjunction with sewage solids when they arrived at the farm. [illegible] while improving the quality of the effluent very greatly. The lime was added to the sewage before it was pumped to the farm, and there was no preliminary tank treatment. By this method the lime would doubtless become thoroughly mixed with the sewage, but tank treatment at the farm would seem to have been indicated; while it would appear probable, on the face of it, that the incrustation of the pumping main—now about to be duplicated—may have been very largely due to the application of the lime at the pumping station. The temperatures of the brewery wastes at Burton are frequently high, and this accentuates any smell there may be by tending to hasten the decomposition of the waste liquors, sulphuretted hydrogen being set free.

At Stratford-on-Avon the sewage sometimes contains up to about 40 per cent of brewery waste. The sewage in this particular instance is treated by means of septic tanks, percolating filters, and land, and a good deal of smell was caused at times by the septic tanks; this smell, however, was very considerably reduced by the lime treatment adopted by Mr. H. D. Bell, the chemist and manager. The quality of the effluent obtained, it should be stated, is of high class.

With regard to the treatment of brewery wastes upon land, unless good preliminary tank treatment is employed there will usually be times when the effluent smells more or less of beer; albeit the land may be of excellent quality, both as regards soil and subsoil.

At Shepton Mallet, some years ago, crude brewery wastes were admitted direct to the sewers, their volume being equivalent to about 33 per cent of the total sewage flow, and nuisance from smell occurred, not only at the sewage farm, but near the manholes in the town. At that time the sewage, after light tank treatment, was dealt with upon land of very poor quality lying on a steep slope. Nuisance arose from smell, and from fungus in the stream into which the effluent passed. Subsequently, the breweries gave their wastes preliminary treatment in tanks with lime and alumino-ferric before discharging them into the sewers. The sewage was also given full tank treatment, together with a small dose of lime, and sludge pressing was adopted. The nuisance from smell ceased in consequence, and the fungus disappeared from the river.

Later on percolating filters were put down to keep

pace with the growth in population, and also to assist the land, ordinary settlement being adopted in lieu of chemical precipitation. Smell from the tanks increased, but only in the actual vicinity of the tanks, and a very good effluent was obtained.

The writer has known an instance where contact beds following settling tanks were completely thrown out of action by an acid tank liquor, analyses showing that the contact beds were effecting no purification whatever. A small dose of lime added to the sewage before it entered the tanks neutralised this acidity, and the contact beds began to yield satisfactory results.

In this particular case it was by no means clear that there was not some acid liquor coming down from the brewery occasionally, and, as a matter of fact, sulphuric acid is frequently used in breweries for cleaning out various vessels. Stale beer, as is well known, very soon becomes intensely acid.

Regarding cases where the brewery wastes must be dealt with without admixture with sewage.

Percolating filters offer a much better chance of thoroughly oxidising a highly polluting* liquor than contact beds, and with the latter the first flush from the beds is nearly always putrescible. The Sewage Disposal Commission arrived at the conclusion (Fifth Report, p. 119) that, "taking into account the gradual loss of capacity of contact beds, a cubic yard of material arranged in the form of a percolating filter will generally treat satisfactorily nearly twice as much tank liquor as a cubic yard of material in a contact bed." They go on to say, however, "In the case of sewage containing substances which have an inhibitory effect upon the activity of micro-organisms, the working power per cube yard of filter of either type may be more nearly equal. This point, however, is not clearly established."

The inhibitory substances mentioned here have reference to sterilising matter—such as that contained in gas liquor and the like—and do not apply to brewery wastes, the only sterilising agencies in which are acid and arsenic, the latter in negligible quantities. Moreover, it has been shown by experiment that in the case of tannery wastes very large amounts of arsenic indeed may be introduced without stopping or inhibiting nitrification.

The difficulty arising if percolating filters are used for dealing with a strongly smelling septic liquor would be from the smell caused during distribution, and if it is intended to treat septic brewery wastes in such a way, it would be preferable to treat it in the first place by single or double contact, and subsequently thoroughly to oxidise the resulting contact effluent by passing it through a percolating filter, when the question of smell would hardly be likely to arise.

There is no question but that contact beds as a first process after tank treatment cause a minimum of smell; but, on the other hand, especially in the case of small installations, where expert supervision is often lacking, attention is apt to be focussed on the depth of sludge in the tank, increased suspended matter in the tank liquor entering the contact beds not receiving much attention. If the tank liquor the beds are receiving is heavily charged with suspended matter, the tank naturally does not contain much depth of sludge.

If contact beds are used, as nearly every [illegible] it will be found that triple contact will be necessary to [illegible] containing more than 3 or 4 parts of suspended matter per 100,000, or possessing more than about 4 parts of dissolved oxygen in five days.

In constructing small experimental percolating filters for the treatment of brewery or other similar wastes, it may be noted that a cheap and efficient method of retaining the filtering material in position is to use small-meshed galvanised wire netting supported by wooden posts spaced at intervals, thereby obviating the necessity for walls of brick, stone, or large clinker. For filters treating such liquors as pot-ale from distilleries, which is extremely acid, the netting should be carefully protected by dipping in Japan paint or in tar. If even stout galvanised sheets are placed over tanks containing crude pot-ale, they become corroded through in quite a short time.

Regarding the use of by-products derived from brewing, the grains form, as is well known, excellent feeding stuff for cattle. The yeast at some breweries is filter-pressed, while in other cases it is discharged to the drains. It would seem very advisable to keep back yeast cells from the sewers as far as possible.

In many cases where brewing wastes are dealt with by a separate purification plant, there is often a good deal of smell arising from heaps of spent hops, refuse screened out from cask and bottle washings, &c. A sprinkling of soot over such heaps has been found to be efficacious in keeping down smell. Bleaching powder is another useful deodorant which can be used, while manganate of soda can be applied in the form of a solution and sprayed on the refuse. Sodium manganate is a dark-green chemical, a good deodorant, and might be used much more extensively at sewage works where smell arises; it was used at Wimbledon some years ago by the late Santo Crimp, the manganate being dissolved in warm water, and used at the rate of about 2 grains per gallon.

The writer knows of no other trade refuse so liable to give rise to nuisance from moulds and fungi of different kinds as brewery waste. Creamery waste is bad in this respect, but a very slight dribble of brewery waste in a stream will very soon result in the bed becoming covered with masses of fungus.

It seems probable that the yeast cells present have a good deal to do with this production of fungoid or gelatinous growths, many of which are often suffused with a pinkish tint. Apparently they do not thrive so well in a very polluted liquid, as in one which contains a certain amount of oxygen in solution.

The nuisance from growths of this kind is generally caused by their decay and detachment, which often happens in hot weather, when presumably the liquid in which they grow does not contain sufficient oxygen to support them. In this respect it has often been remarked that some of the common sewage fungi—*e.g.*, *Leptomitus lacteus* and *Beggiatoa alba*—most growing in a polluted stream, always appear to thrive more luxuriantly at points where comparatively clean water enters the polluted stream.

* By "strong" liquor is meant a liquor capable of using [illegible] oxygen to [illegible] purification.

ROAD MAINTENANCE.

THE QUESTION OF CONTRIBUTIONS.

In the House of Commons on the 11th inst. the President of the Local Government Board was asked when it was intended to set up the proposed Joint Committee on the subject of contributions to the cost of road maintenance by the owners of motor vehicles causing exceptional damage to the roads.

Mr. Herbert Samuel said he had been making inquiries of the authorities of both Houses. These were not yet complete. He hoped it might be found practicable to set up the proposed committee during the present Session.

PRO PATRIA.

TWENTIETH LIST.

We present herewith the twentieth list of municipal engineering and sanitary officials who are taking part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

Adamson, —, engineer and surveyor's department, Chiswick, sergeant, Queen Victoria's Rifles.
Bates, A. G., engineer and surveyor's department, Chiswick, R.A.M.C.
Williams, W.C., engineer and surveyor's department, [illegible], Royal Bucks Hussars.

Swansea Electricity Works.—The extensions which have been in progress for a long time at Swansea Corporation electrical works and which are to cost about £40,000, are now almost complete. It is claimed that the works are now sufficiently powerful to meet the requirements not only of the existing borough, but of future extensions. It is hoped to be able to compete with gas on even terms.

New Scheme for South-West Birmingham.—The Town Planning Committee of the Birmingham City Council are engaged in the preparation of a new scheme of town planning for South-West Birmingham. The area of land covered by the scheme is about 9,000 acres, and it forms the largest scheme yet undertaken in Birmingham. It applies to all the undeveloped land in Selly Oak and Northfield Wards and will connect on the one side with the scheme now being prepared for South Birmingham, and on the other side with the Quinton and Harborne scheme.

CORRESPONDENCE.

The Editor does not hold himself responsible for the opinions expressed by correspondents.

ELECTRICALLY-DRIVEN DUST VANS.

To the Editor of THE SURVEYOR.

SIR,—My attention has been drawn to an article under the heading "Refuse Disposal," appearing in your journal of 29th ult. In this some reference has been made to a test with an Edison accumulator-driven vehicle which was engaged upon the collection of house refuse, in competition with a super-heated steam wagon, also a petrol wagon.

It may interest your readers to know that Mr. J. G. Carey, engineer to the Heston and Isleworth District Council (where the tests took place), appreciating that he had no previous experience with these vehicles, made ample allowance for every item of maintenance, his method being to ask manufacturers for what amount per annum they would undertake all liabilities, not necessarily intending to accept that contract, but in order to have these figures as a safeguard.

Even under these conditions the saving was in favour of the electric to the amount of £5 per annum. £5 on one vehicle is unimportant, but where a number of vehicles are actively employed as in the case of a municipality, this £5 becomes an important item. I presume that the method of arriving at the steam wagon maintenance figures was based on the same principle; hence the reason for allowing two days per month for its overhaul. In the case of the Edison electric, one half-day per month would be ample, whereas with the more complicated steam engine this may not suffice.

Mr. Carey in his desire to allow for all possible contingencies may have taken rather a high estimate for the steam vehicle, but he has done so equally with the electric, the writer's experience being that the electric vehicle Mr. Carey is purchasing will prove far more economical than he has anticipated in his report.

Without wishing in any way to decry any type of steam wagon, the writer, who has had experience with both types of vehicles, is certain that the electric will prove more economical, provided the class of work is of a suitable character. A further consideration must not be lost sight of, and that is the possibility of objections being raised to the noise of a steam wagon run in residential districts each morning.

A test has recently been made by Mr. C. Bruce Tomes, surveyor to the Barnes Urban District Council, on the same class of work, with the result that he, too, has decided in favour of the electric, and his council has now voted in favour of the purchase of four of our standard dust collection vans, fitted with the electrically-operated tipping gear, which does so much to reduce the time wasted by the less modern hand-tipper hitherto available.

These four vehicles will carry a larger amount of refuse per annum then eleven horse vans did hitherto. —Yours, &c.,

Edison Accumulators, Limited.
W. H. L. WATSON,
General Sales Manager.

Edison Building,
Duke-street, S.W.
February 11, 1915.

RECENT CIRCUMSTANCES AFFECTING ROADS.

To the Editor of THE SURVEYOR.

SIR,—The Roads Improvement Association has, through its engineers and expert advisers, exceptional opportunities of watching the behaviour of roads as affected by traffic and climatic influences. Since October last the weather conditions have been abnormal, and this, combined with the exceptionally heavy traffic which has arisen in many localities owing to the war, such as the movement of troops, guns, ammunition and so forth, will, it is feared, seriously affect the roads for some time to come.

The association is fully aware that every attention is given to our roads by those responsible for their maintenance, but it considers that the general public may not be aware of the exceptional circumstances which lately have pertained.

From a report by the Thames Conservators it appears that nearly six months of average rainfall fell during November and December, and that the month of January was little better. In addition, the changes of temperature were extraordinary—an almost summer temperature of 54 deg. Fahr. was followed by a drop of 20 deg., and succeeded by a similar rise, and this occurred seven or eight times during the month of December.

These sudden and [illegible] changes of temperature accentuate the [illegible] caused by the passage of traffic, as the water is, in effect, "pumped" in and out of all porous surfaces exposed to the weather with disastrous effects. This "degrading" influence has been very severely felt in the case of some of the recently completed modern roads, especially those which had scarcely been finished when these abnormal climatic conditions commenced.

It is well known that even with some of the modern systems of road surfacing the necessary consolidation is not acquired until the original process of rolling has been supplemented by at least a few months of wheeled traffic.

It must be expected, therefore, that many bituminous road surfaces which were completed during the autumn will show [illegible] deterioration from the causes that have been mentioned. It may be some consolation, however, to road surveyors, who may be blamed for the bad condition of their roads, to know that these weather conditions have affected nearly everyone alike.

It would be interesting to ascertain how far different parts of the country have been similarly affected, and what has been the effect on the various modes of road construction — for instance, whether the "penetration methods" have stood better than "mixing methods"; and how far ordinary water-bound macadam, protected by several years' of tar-painting, has stood this exceptionally trying time.

It would be of considerable interest if surveyors who have suffered from these weather conditions would communicate with the association, sending reports of their experiences, with notes, as to exceptional rainfall, changes of temperature, and other memoranda.

If a record could be prepared of these reports and observations, and a comparison made as to the behaviour of the various new methods of road construction under these trying conditions, much valuable information of the greatest service to all now engaged upon road work would be available. Such information would also be of considerable interest to all road users, and, in fact, to the whole community.—Yours, &c.,

WALLACE E. RICHE,
Secretary,
Roads Improvement Association.

15 Dartmouth-street,
Westminster, S.W.
February 13, 1915.

SUPERANNUATION.

To the Editor of THE SURVEYOR.

SIR,—Having read with great pleasure and interest your article—with which I thoroughly agree—upon Mr. E. P. Hooley's resignation, it struck me how helpless municipal officers are with regard to retiring allowances.

Here is Mr. Hooley's brilliant service of twenty-five years—and many more of us have done similar periods of brilliant work, almost unrecognised. If any recognition—*i.e.*, retiring allowance—be given, it will only be an act of grace; yet a policeman or Poor-law officer can claim such a reward as a right.

What an argument for the superannuation scheme which has been on the tapis so long! When, oh! when will it reach the House of Commons? That all the other branches of rate-paid officials can claim superannuation benefits, excepting ours, ought to be an all-sufficient reason for its extension to ourselves. An optional Act is useless, so far as most rural district councils are concerned. It must be compulsory. But let it be soon.—Yours, &c.,

R.D.C. SURVEYOR.

February 17, 1915.

Rifle Ranges for London Parks.—London County Council Parks Committee have been considering the question of provision of rifle ranges. The committee recommends, as a matter of urgency, that the power being sought from Parliament to provide accommodation for games and recreations in parks and open spaces shall be extended to include rifle ranges.

Law Notes.

Edited by J. B. REIGNIER CONDER, 57 Moorgate-street, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction i.e., without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

Compulsory Purchase. Ascertainment of Price.—An interesting point in connection with the compulsory purchase of land by local authorities was decided in *Re South-Eastern Railway Company and London County Council* (Chancery Division, Mr. Justice Eve). The company were the owners of two freehold shops, Nos. 9 and 10 Strand, at the corner of Craven-street, and of several adjoining houses fronting the latter street. The council gave notice to the company to treat with respect to a strip forming a portion of the site of the shops, and this notice was afterwards superseded by a contract between the parties for the sale of the land required at a price to be determined by arbitration under the Lands Clauses Acts. The arbitrator fixed the price at £18,330; but he declared that if (as contended by the council) the true measure of the price were the difference between the aggregate value of the whole of the Strand and Craven-street property before the service of the notice to treat, and their aggregate value after the taking of the frontage slip, the price would be only £3,465. Mr. Justice Eve decided against the council's contention. In the course of his judgment his lordship said that there was no authority for the proposition contended for by the council. But that was not the same thing as saying that it could not be established, and it was necessary to examine and see what would be the consequences in practice of adopting the views put forward on their behalf. It happened here that the interest of the company in all the property was identical: they were beneficial owners in fee of the whole. But if the council were right, the principle for which they contended would be applicable to all cases in which any interest in contiguous land could be imported into the calculation, and the arbitrator—or it might be the jury—before being able to come to a decision, would have to embark upon an inquiry as to the nature of such interest, and in what manner and to what extent, if at all, it depreciated in the hands of the particular vendor as compared with one who had no such interest, the value of the land forming the subject matter of the contract. This would not only be highly inconvenient, and tend greatly to increase the difficulties and expense attendant on these transactions, but it would bring about some startling results, the most obvious being that it would upset all uniformity of value, inasmuch as the value of the identical piece of land in the hands of one vendor might be assessed at many times its value in that of another, and this, not from any intrinsic distinction, but by reason solely of extraneous considerations. Moreover, it would be calculated to work injustice in that a vendor compelled to sell, and who was intended by the Legislature to be compensated for being compelled to sell, might have to accept a price far less than he would have obtained from any other purchaser, and out of all proportion to the true value of the land. In his opinion, these considerations demonstrated the impossibility of accepting the argument urged on behalf of the council, and he must fix the price at the sum of £18,330 mentioned in the award.

QUERIES AND REPLIES.

[illegible] queries are replied to [illegible] nom de plume. [illegible] "X. Y. Z." and should be addressed to "The Engineer" [illegible] Surveyor [illegible].

Extraordinary Traffic over New Streets.—"Puzzled" writes: This council recently paved several new streets on a compact estate under the Private Street Works Act, 1892, but these have not yet been adopted as public highways. The east end of these streets terminates on the west side of an old occupation road to which there has never been legal access. Before these streets had been taken over and adopted by the council as the public highway authority, the erection of a new school was commenced in the field at the east side of the occupation road. The builder was requested not to use the new streets, but to keep to the occupation road, which road had previously served for the field in which the school is being erected. This he promised to do, and did, until his traffic cut up the occupation road and made it impossible, when he wrote to the council's surveyor to the effect that if the council did not repair the occupation road he would use the new residential streets. As the council could not spend public money on the occupation road, they could not comply with his request, and according to his threat he began to use the new streets, to the dismay of the frontagers who have to pay for them and looked to the council for protection. Posts were fixed at the east end of each street, but the builder pulled them out. To prevent this a rail was nailed across the ends as a barrier, but he has since sawn them down, and is continuing to use the new streets. What is the council's position, and what action do you recommend to prevent the builder using these new streets? How could we compel him to make good the occupation road over which the public have only a footpath right of way?

Although the new streets have not yet been adopted they have presumably become public highways by user. If so, the builder cannot be prevented from using them, but, on the other hand, he will be liable for expenses of repair due to extraordinary traffic thereon, conducted by him or by his order. Probably the parties employing him would also be liable. As regards the occupation road, if the builder has by his traffic rendered it less convenient for foot passengers, he can be indicted for a nuisance. (See Pratt and Mackenzie's Law of Highways, 14th edition, p. 110.)

House Drainage. New System of Sewerage.—"W. L. F." writes: An urban district council has lately carried out a new system of drainage which will sewer a district previously without a system. Many buildings at present are drained into cesspools, which were constructed in accordance with the urban council's requirements and by-laws. These cesspools are emptied when necessary by the urban council's own workmen, the cost being defrayed by the council. The council now require the buildings to be drained into the new sewers, and the question arises, who is to pay the cost of doing the work? Can the council call upon the owners to reconstruct their drains, and connect to the new sewers, or must this be done at the expense of the council?

Except with respect to such of the drains (if any) as are not of themselves sufficient for effectual drainage, the council must pay the cost of constructing new drains and connecting them with the sewers under sec. 21 of the Public Health Act, 1875. (See Lumley's Public Health Acts, 8th edition, p. 85.)

Railway Level Crossing. Obstruction of Road Traffic.—"A. R." writes: Some years ago a railway was constructed and a level crossing made near to the station, the gates being controlled from the signal-box. At the time the railway was constructed the highway was [illegible] only important one leading to a small village, and the gates could be closed for shunting purposes [illegible] periods without causing very much inconvenience. Since that time the district has developed and the station has become an important junction, where a considerable amount of shunting is done over the level crossing, and frequently the highway traffic is held up for five or ten minutes, causing very great inconvenience. Is the railway company not acting contrary to sec. 5, Railway Clauses Act, 1863? If so, who should take action?

This is undoubtedly a contravention of the section. The highway authority should take action with the concurrence of the Attorney-General. In *Attorney-General, at the [illegible] v. London and North-Western Railway Company*, 1900, 1 Q.B. 78, an injunction was granted to restrain a contravention of sec. 48 of the Railways Clauses Consolidation Act, 1845 (limiting the speed of trains at level crossings), notwithstanding that there was no evidence of injury to the public.

Private Street Works. Reserved Strip.—"Private Street" writes: A new street was laid out recently as shown on accompanying plan, and partly made up. The owners of the land reserved

a strip 2 ft. wide, between the new street and property marked A, presumably in order to prevent right of access. The street is now about to be made up under the Private Street Works Act, 1892, and the usual proceedings followed, and charges at per foot frontage will be made against the owners of the strip of land referred to. Can the owners, to avoid payment of charges, throw the strip into the roadway, thereby throwing the frontage to street work charges upon

the property marked A. This would be a contravention of the plan deposited and approved, which (power a road thus by-laws require a footway of 36 ft., and the 2 ft. strip marked A is reserved). If this were done, what remedy have the owners of property marked A in a road [illegible] as their property has already been [illegible] by the laying out of the street, and the new frontage would be useless to them?

The proceedings under the Act have reference to the new street as existing at the date of the resolution to do the works, and the owners of the strip cannot escape liability as frontagers by removing the fence between the strip and the street after the date of the resolution. Even if they had removed the fence before that date the public would not be bound to accept the strip as part of the street, and unless and until so accepted the owner would remain chargeable in respect thereof.

REPAIR OF ROAD.—L. M. [illegible] A [illegible] pany acquired a large plot of land by Act of Parliament in this district, and have since erected upon a portion of it a furnace and steel sheddings. The road is in a deteriorated condition through excessive [illegible]. Kindly say what powers an urban authority have herein.

Unless the road is repairable by the inhabitants at large the urban authority can make it up at the expense of the frontagers. But if the Private Street Works Act, 1892, has been adopted the canal company cannot be charged in respect of any land which at the time of the laying out of the street was used by them solely as a part of their canal, towing paths or works and which has no direct communication with the street. The proportion otherwise chargeable to the company must be paid by the other frontagers. Should the company afterwards make a communication with the street, they will become liable, and the frontagers will be entitled to be refunded the proportion so paid by the latter.

Glasgow "Common Good" and Housing.—The town clerk of Glasgow, Mr. John Lindsay, is of opinion that the proposal by a special committee of Glasgow Corporation that £30,000 out of the revenue of the Common Good for the current year be lent free of interest, to erect cottages at Ruddle for the working classes, is illegal. Mr. J. Avon Clyde, K.C., and Mr. M. P. Fraser, advocate, concur in this opinion. The opinion is based upon the view that the Common Good is held for the benefit of the community, and cannot, therefore, be used legally in favour of a limited number of persons.

More Money for Cheshire Roads.—Colonel Dixon, in moving the minutes of the Main Roads and Bridges Committee at the Cheshire County Council meeting last week, stated that the cost of keeping up the roads for the next year would be considerably more than previous years. They had tried to cut down expenses in every way, and they were carrying out in the county only those improvements which had already been started. Notwithstanding all their cutting down, there would be a deficit. They were not going to receive a £10,000 grant they expected from the Road Board, as all the money for the roads was to be kept on one side by the Treasury for the purpose of using it to meet unemployment. There was not much unemployment at the present moment, but there might be when the war was over.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

I [illegible] among the [illegible] supply rather [illegible] in that it [illegible] known that the particular algæ which give a slight colour and taste to water generally occur in filter-beds. [illegible] and not having [illegible] would [illegible] gone through. Is the only cure for this occurrence the emptying of the particular filters which are affected and their treatment with hot lime, or is there any other cure for [illegible]? [illegible] to the subject?

* * * *

Is it a fact that [illegible] the buildings [illegible] bombardment by shells than other buildings constructed of [illegible] brick or reinforced? Are there any authentic cases of such buildings, and [illegible] information on this subject be of great interest?

* * * *

Will [illegible] to decision [illegible] to be allowed for certain descriptions of road surfaces? Is it safe, for instance, to lay [illegible] gradient as 1 in 15? What is an allowable gradient for tar-slag? Should it be the same as for asphalt? Should there be any difference between hardwood blocks or softwood blocks? Can all classes of granite setts be laid at the same gradient? Would not a practical discussion on this question in the columns of THE SURVEYOR be of [illegible]

* * * *

Have we heard the last of the suggestion that some [illegible] should be appointed to act for the Front to advise on the question of the necessary repairs to the roads which have suffered so terribly [illegible] Has the War Office been approached on the subject from the proper quarter, and what has been the result if any representations have been made on these lines?

* * * *

When will [illegible] be issued, or when will Parliament find time to pass some Bill dealing with this important subject? Is it a fact that the only Act of Parliament dealing with this question, so far as the Metropolis is concerned, is that of the Metropolitan Streets Act of 1867? Is it also a fact that the only police notice issued under this Act is one for regulating traffic in certain specified streets, and providing that "No person shall . . . between the hours of 10 in the morning and 7 in the evening . . . drive or conduct along any street any cart, carriage, or other vehicle . . . which exceeds in length 35 ft., or which projects [illegible] more than 1 ft. from the sides of the vehicle . . . carry in any way along any street any ladder, scaffold pole, or other article which exceeds 35 ft. in length or 8 ft. 6 in. in breadth?" Is it to be conceived that this appears to be the only regulation of traffic in this mighty Metropolis? Surely after forty-[illegible] Act is [illegible]

Borough Surveyor's "Unclean" Offices.—At a meeting recently of the General Purposes Committee of the Grimsby Town Council it was reported that the borough treasurer's and borough surveyor's offices were in a very unclean condition and sadly needed cleaning and painting." It was decided that the borough surveyor should get tenders for the necessary work and report at the next meeting. A councillor remarked that it meant spending a lot more money because of the [illegible] economy practised at the first place.

Society of Engineers: Lectures to Affiliated Societies.—Following the practice established last year of giving lectures to the members of student engineering societies affiliated to the Society of Engineers, Mr. Percy Griffith, M.INST.C.E., a vice-president of the society, lectured on the 4th inst. before the Birmingham University Engineering Society on the subject of "Public Water Supplies." There was a fair attendance of students, who evidently much appreciated the lecture. The council have made arrangements for the delivery during the year of lectures to the members of other affiliated student societies.

ABERDEEN WATER.

LIME TREATMENT OF RIVER SUPPLY.

An interesting report on the subject of the water supply of Aberdeen has been prepared jointly by Mr. Cecil H. Roberts, M.INST.C.E., the city water engineer, and Dr. Matthew Hay, the medical officer, the document in question being accompanied by a report by Dr. A. C. Houston, director of water examination to the Metropolitan Water Board. The reports deal with the results of the provisional scheme as the basis of a permanent scheme for the purification of the water supply by liming, storage, and filtration, Dr. Hay and Mr. Roberts having been authorised by the town council to consult Dr. Houston in the preparation of a report on the results of the operations at Invercannie for the information and guidance of the council.

For many years, the water engineer and the medical officer point out, the only means of purification of the water supply as taken from the Dee has been the settling reservoir at Invercannie and the service reservoirs at Mannofield, Slopefield, and elsewhere in the city. These reservoirs have allowed of a certain amount of purification by sedimentation, but their main advantage has probably been in delaying the arrival of the water in the city for such time as enabled the disease-producing organisms to die out or become greatly reduced. Two filters were provided at Invercannie when the present waterworks were first constructed; but as, with the rapid growth in the consumption of water by the city, these filters had become quite insufficient to cope with the supply, they had been permitted to fall into disuse.

The present provisional purification scheme has embraced :—

(*a*) A remodelling of the existing reservoir at Invercannie.

(*b*) The modernising of the old filters and the construction of new filters.

(*c*) The construction of liming works.

PROVISIONAL WORKS.

A gauge has n has been constructed on the line of the aqueduct between the intake and the settling reservoir. In this basin the whole water supply passes over and is measured by a rectangular weir, and the lime water previously prepared in the adjacent liming plant is added to the water.

The existing circular settling reservoir, having a capacity of 12,000,000 gallons, has been altered by the construction in its basin of a helical reinforced concrete baffle wall, designed to prevent short-cutting of the water from the inlet to the outlet, and thus to secure more completely the storage effect of the full capacity of the reservoir.

The two original and disused sand filters have been reconstructed on modern lines, and three new and additional sand filters are in course of being completed. The total area of filtration will now be about 2 acres, with a depth of fine sand of 3 ft. . . .

BACTERIOLOGICAL EFFECT OF LIMING.

With the view of reducing as far as possible the amount of free lime in the water as supplied to the consumer, and of limiting the increase of hardness due to lime, we have endeavoured, among other points, to ascertain whether a less amount of lime than that tried in 1913—namely, 3 parts per 100,000 parts of water—would suffice in practice to destroy the bacillus coli.

It has recently been suggested by certain authorities in the United States that, provided sufficient time is allowed, the bacillus coli in water can be killed by an addition of lime sufficient to neutralise the carbonic acid and bicarbonates in the water, and that no excess free lime is necessary. The Aberdeen water requires usually somewhat less than 1 part of free lime to 100,000 parts to effect neutralisation. From laboratory experiments made in the spring of 1914, with no excess free lime and with a very minute excess (0·1 to 0·2 parts of CaO per 100,000) we obtained results that appeared to support the American view. But when these results were applied at Invercannie, first, by adding 1 part of lime (including the lime necessary for neutralisation), and, subsequently, 1½ parts per 100,000 to the whole water supply as it entered the reservoir, the action of the bacillus coli was found to be unreliable as tested at the outflow from the reservoir. At this time the reservoir had not been remodelled, and probably short-cutting of much of the water was taking place and was preventing the water having sufficient time to act on the bacillus. For, unless the lime is present in great excess, the destruction of the bacillus is never immediate. Tests of the water at the city were not conclusive, as it is known that there is a considerable percolation of subsoil water into the aqueduct in its course to the city, owing to its faulty condition.

The proportion of lime added was raised to 2 parts, but we thought it futile to make any further tests at the reservoir until it had been remodelled by the introduction of a helical baffle. The remodelling was begun at once, and was finished at the end of July. . . .

For about three weeks, commencing on August 11th, the amount of water passing through the reservoir at Invercannie was reduced to about one-seventh of the total supply, the remainder being allowed to proceed direct to the city; and the flow of the water through the reservoir was so regulated as to occupy about seven days, thus representing experimentally the period for which it is intended the whole water supply will be detained in the reservoirs at Invercannie when the reservoir accommodation is increased to the extent proposed under the permanent scheme referred to in the joint report by the water engineer and Mr. C. P. Hogg in May, 1913. About 2 parts of lime continued to be added to the whole supply, as had been done since the spring. Tests for bacillus coli were made twice weekly of the water before liming and of the limed water as it left the reservoir. Although the bacillus was present fairly abundantly in the raw or untreated water—being found on an average in about 1 cub. cent.—it proved to be invariably absent from the water leaving the reservoir.

It was intended to go on to test the effect of reducing the proportion of the lime, but it was thought advisable not to run any risk by reducing the lime, as at this time the larger of the two Mannofield reservoirs was out of action for the purpose of being roofed, and its storage effect in assisting the action of the lime on the percolating water of the aqueduct was being lost. It was considered desirable to give the water supply such advantage in storage as could be obtained from passing the whole of it through the Invercannie reservoir. This meant, for the whole supply, about one day's storage at the level at which the reservoir then stood. The tests for bacillus coli were, however, continued, and it was satisfactory to find that, even with a storage or contact of the lime with the water for only one day, the effluent water from the reservoir contained no bacillus coli, although repeatedly examined. This was a much better result than was obtained from the reservoir outflow in 1913, when 3 parts of lime were being added, but when the reservoir had not been remodelled.

This excellent result with about 2 parts of lime and one day's storage serves to justify the hope that, with the remodelled reservoir and a seven days' storage, the lime in actual practice might, as in the laboratory experiments already mentioned, be reduced, without loss of efficiency, to a proportion very slightly in excess of the amount required for the neutralisation of the bicarbonates, with, consequently, very little free lime to be subsequently carbonated. But, for the reasons just stated, we were for the time deterred from making any further experiments in this direction at Invercannie. It is probable that the lime can be reduced to, say, 1·5 parts (about 1 grain per gallon), and possibly further, depending on the amount of bicarbonates in the water, which varies somewhat. Dr. Houston is also of this opinion. . . .

HARDNESS.

The addition of lime to a water of such natural softness as the Dee water will increase its hardness. The total hardness of the Dee water is equivalent to about 2 to 3 parts of $CaCO_3$ per 100,000 parts, or about 1½ to 2 Clark degrees. Analyses of the treated water after leaving the Invercannie reservoir show that, with 2 parts of lime per 100,000 added to the water before entering the reservoir, the hardness of the water as delivered in the city is raised to about 3½ to 4 Clark degrees, which would still leave the Aberdeen water within the category of soft waters as ordinarily defined.

Some addition to the hardness of the Aberdeen water supply will, in certain respects, be an advantage, as in serving to prevent the considerable corrosion that takes place at present in the iron water pipes.

FILTERS.

A series of weekly bacteriological tests were made in August and September of the efficiency of the first-

The Surveyor
And Municipal and County Engineer.

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completed filter, which by that time had been in action for several weeks previously. The tests extended over the period when first one-seventh of the water supply was being treated in the reservoir, and later when the whole supply was being treated. The water from the reservoir was being run through the filter at the rate of 8 in. an hour—the rate proposed for the whole water supply. This rate is about twice the rate in more common use, but is accepted in some places as sufficient, even where no additional purifying process, such as liming, is in operation. There was little scope left for the action of the filter, as the bacillus coli had already been destroyed, and, except at one of the tests, the ordinary germ count on gelatine cultures of the water leaving the reservoir was already well under the 100 per cub. cent. laid down by Koch as satisfactory for a filter effluent. The filter did not appear to have much effect, possibly owing, in some measure, to the multiplication of harmless bacteria which takes place in the underdrains in most filters. As no bacillus coli remained in the limed water as it left the reservoir, there was none to be removed by the filter. In an earlier experiment, however, made before the reservoir was reconstructed, and while bacillus coli was present in the effluent of the reservoir, the bacillus coli was wholly removed by the filter during the later part of an experiment that continued for about a month.

The knowledge as to what modern sand filters can accomplish is so well established that no doubt can be entertained as to the efficiency of the Invercannie filters when all the works are completed and the filters are in full operation.

It is conceivable that the presence of free lime in the water may interfere with the proper formation of the organic film on the filter surface, which is usually regarded as the most active part of the filter in the removal of organisms. If so, this interference can, of course, be prevented by the carbonation of the lime before the water reaches the filter.

The effect of the filter in clarifying the water and in removing all suspended matter was well marked.

COLOUR.

Both the liming treatment of the water in the reservoir for seven days and the subsequent filtration had considerable influence in diminishing the colour of the water when the colour was high; but there was little effect when the colour was low.

CONCLUSION.

In his report Dr. Houston expresses full confidence in the merits of the liming process and approves generally of the whole scheme of purification.

It is in view, if the results of the provisional scheme are approved by the town council as the basis of a permanent scheme for the purification of the water supply, that it will be possible, with a large increase of the reservoir storage at Invercannie, together with some further increase of the filter-beds, to provide a triple or threefold system of purification by (*a*) liming, (*b*) storage, and (*c*) filtration, as compared with a commonly practised twofold system of storage and filtration. It is believed that the introduction of liming, which is in itself effective in the removal of disease-producing organisms, and is at the same time an inexpensive method of purification, and easily capable, by variations in the amount of lime, of being strengthened or moderated as may be required from time to time to meet exigencies, will justify a scheme of purification in which the means for storage and filtration, both of which are very costly to provide, may be considerably less extensive than would be necessary if liming were omitted, and in which the three means of purification would yet be so balanced that should, through accident or neglect, any one of them temporarily fail, the remaining two would afford, in ordinary circumstances, adequate protection.

COST OF SCHEME INCLUDING LIME TREATMENT.

ESTIMATE.

First Instalment for 8 Million Gallons per Day.

Improvements at intake	£12,000
Liming plant, buildings, &c.	6,200
Storage and settling reservoir	72,550
Filters	23,000
New aqueduct and repairing existing aqueduct	205,000
Extensions at Culls pumping station	11,300
New service reservoir and connections	22,200
	£352,250
Contingencies 15 per cent	52,750
	£405,000
Land, easements, repairs to roads, &c.	20,000
	*£425,000

Second Instalment for further 1½ Million Gallons per Day.

Liming plant	£500
Filters	4,000
Pumping plant	4,600
Reservoirs	13,100
	£22,200
Contingencies	3,200
	£25,400

CECIL H. ROBERTS,
City Water Engineer.

* NOTE.—The cost of the provisional purification works at Invercannie—viz., £28,700—which has already been mostly expended, is included in the sum of £425,000.

At its meeting last week the Water Committee of the Aberdeen Town Council unanimously agreed to recommend the promotion in Parliament of a Bill empowering the corporation to carry out the proposed works.

Town Planning Institute.—"The Economics of Town Planning in Relation to Land Development" is the title of a paper which Mr. G. L. Pepler, F.S.I., will read at a meeting of the Town Planning Institute to be held this evening at 92 Victoria-street, S.W. The chair will be taken at 8 o'clock.

The Art of House Planning.—In the course of a recent lecture at Birmingham University on "Town Planning and Civic Design," Mr. Barry Parker demonstrated the interdependence of the house plan upon the plan for the lay-out of the ground, and the plan for the lay-out upon the type of house plan proposed to be used. He pointed out that by carefully planning each house so as to make the fullest use of the advantages the site offered, architects could do a great deal to advance the art of house planning. He referred to the advantages of the terrace house over the detached house in districts where the frontage was necessarily limited, and added that the detached house in the suburbs had always been one of the most difficult things the town planner had to deal with in his endeavours to get some sense of unity and quiet dignity in such districts.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

Mr. E. W. Pugh, of Southampton, selected the following books in respect of the January premium, which was awarded to him:—

"Elementary Principles of Reinforced Concrete Construction," by E. S. Andrews (Scott, Greenwood & Son), and

"The Testing of Materials of Construction," by W. C. Unwin (Longmans).

These have been duly forwarded to him.

QUESTIONS.

This week answers are invited to the following questions:—

457. Hydraulics.—A common formula for the mean velocity of flow in streams and artificial channels is $v = c\sqrt{mi}$. Explain carefully the meanings of the various factors on the right-hand side of the expression, and state how the values of c for various kinds of channels have been determined.

459. Sewage Sprinkler.—Describe an efficient form of sewage sprinkler for percolating filters which requires very little head of sewage to work it. (J. R. H., *Ipswich*.)

460. Sewage Sea Outfall.—Are reinforced-concrete pipes better than cast-iron pipes for a sewage outlet into the sea, which is covered at high water? Compare them as regards initial expense and maintenance. (J. R. H., *Ipswich*.)

461. Applied Mathematics.—Give some simple examples of the application of the calculus to the solution of practical engineering problems. (Student.)

462. Projectiles. Establish a formula for determining the angle at which a projectile should be discharged to secure the maximum range. (T. R.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

456. Strength of Materials.—A rectangular beam is loaded by a weight at its centre. How will the deflection be changed by (*a*) doubling the span, (*b*) doubling the width, (*c*) doubling the depth, (*d*) doubling the load?

It is assumed that the beam is of uniform cross-section throughout its span, and that the ends are merely supported. The formula for this case is:—

$$\text{Deflection} = \frac{a\,W\,L^3}{E\,I}$$

where W = the load

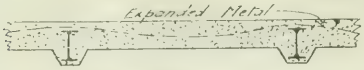
L = the span

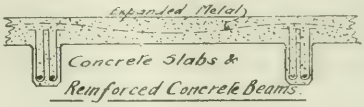
E = Young's modulus for the material of the beam in question

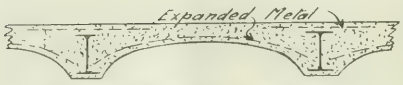
I = the moment of inertia of the beam

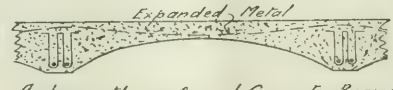
a = a constant, depending on the method of loading and the fixing of the ends.

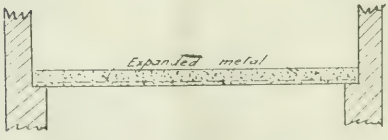
Since in this case W is a concentrated load acting at the centre, and the ends of the beam are

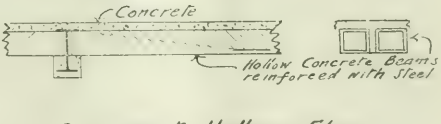












Sketches of Fireproof Floors.

suggested. [illegible] A [illegible] a rectangular [illegible]

$$I = \frac{BH^3}{12}$$

where H is the height and B the breadth [illegible]

Assuming that [illegible] provided [illegible] the formula we have as before

$$\frac{W \cdot 2 L^3}{48 E I} = S\left(\frac{W L}{48 E I}\right)$$

The [illegible] doubled [illegible] produce a deflection [illegible]

The deflection produced by doubling the width is stated to be that is

$$\frac{W L^3}{48 \times 2 E \frac{BH^3}{12}} = \left(\frac{W L}{48 E I}\right)$$

Thus the effect is doubling the width is to halve the amount of deflection.

When the depth is doubled, we have as the formula

$$\frac{W L^3}{48 E \frac{B(2H)^3}{12}} = \frac{1}{8}\left(\frac{W L}{48 E I}\right)$$

[illegible] is equivalent [illegible] When the [illegible] doubled [illegible]

$$\frac{2 W L^3}{48 E I}$$

From the foregoing [illegible] the theorem (E. K. Y.)

458. Fireproof Construction. [illegible] some good [illegible] fireproofing [illegible] a warehouse.

The diagrams [illegible] to these questions.

PRIVATE BILLS.

QUESTION IN THE HOUSE.

In the House of Commons on Wednesday Mr. [illegible] asked the Prime Minister if he [illegible] time during the present Session for Private Bills [illegible] the Second Reading [illegible] Bill [illegible] defeated in the House after much labour and expenditure of money in the Committee Room [illegible] Bills [illegible] Bill [illegible] promoters of such Bills and the waste of time of the Committees.

The Prime Minister [illegible] the question to [illegible] Mr. Asquith answered in the [illegible] Bills raised questions of a public character, and of [illegible] the Government would [illegible] such a power to grant further progress. Mr. Heath would say that he did not include Bills [illegible] a private nature and domestic to the Bill. It was, of course, not easy, *prima facie*, to determine whether a particular Bill was or was not of the latter description; but where [illegible] Second Reading debate, and he was sure the House would be disposed to [illegible] the very [illegible] would probably be [illegible] Committee of Ways and Means.

Billeting and the Expenditure of Local Authorities.

On Wednesday, in the House of Commons the Under Secretary of State for War was asked whether he was aware that in many parishes where troops had been encamped or billeted additional expenditure by the local authorities had been rendered necessary in respect of sanitation and other local services to meet which increases in rates had been imposed; and whether it was the intention of the Government to make good to the local authorities the amount of expenditure so occasioned. In reply Mr. Baker said the question of making good to local authorities expenditure of this character was considered in October last, and instructions were then issued to all General Officers Commanding defining the extent to which it might be defrayed from Army funds.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyors [illegible] with a view to making the information given under this head as complete and as prompt as possible.

INQUIRIES HELD.

Abertillery U.D.C. [illegible] February 9th. Mr. [illegible] Whitley [illegible] Mr. [illegible] Mr. [illegible] Mr.

the purposes of a fire brigade station of certain property in Rendham-road.—The surveyor, Mr. J. E. Hattersley, in answer to the inspector, said that when the new water supply was provided there would be sufficient pressure to deal with all fires in the town without the use of the manual engine they had at present. The inspector asked if the outstanding debts included the loan for the water supply which had been sanctioned but not yet raised. The clerk: That is practically the only debt we have. The inspector: The only reason I am here is that the board was under the impression that the debt was greater than the assessable value, which made an inquiry a statutory necessity. If it had not been for that I would not have come at all. We should have granted the loan at once.

Worksop U.D.C. (February 3rd. Mr. M. K. North).—£2,180 and £520 for road improvements in Gateford-road and Retford-road respectively.—The surveyor, Mr. George Rawson, stated that the improvements were rendered necessary by the development of the town.

APPLICATIONS FOR LOANS.

Ashton-under-Lyne T.C.—£15,675 for school buildings.

Dartford U.D.C.—£7,510 for a housing scheme, £1,700 for street improvements, and £400 for park extensions.

Dublin T.C. £6,000 for the improvement of Lower Liffey-street.

Dunmow R.D.C. £150 for sewer extension.

Kiveton Park R.D.C.—£127 for water-main extension.

Lincoln T.C.—£4,000 for a new school.

Middlesbrough T.C.—£3,000 for water mains.

Morecambe T.C.—£10,000 for golf links and the extension of the promenade.

Radcliffe U.D.C.—£2,604 for road improvements.

Warrington T.C. £18,250 for the purposes of the gasworks.

LOANS SANCTIONED.

Acton U.D.C.—£1,889 for road widening.

Barnsley R.D.C.—£700 for a water main.

Bournemouth T.C.—£2,730 (repayable in twenty years) and £5,070 (repayable in ten years) for works of wood paving in Holdenhurst-road.

Caerphilly U.D.C.—£175 for sewerage works.

Carrickmacross U.D.C.—£700 for the completion of the housing scheme.

Edmonton U.D.C.—£5,967 for street widening.

Grays U.D.C.—£1,483 for surface-water drainage works.

Hammersmith B.C.—£10,000 for electricity mains, plant, house services, and meters.

Holmfirth U.D.C.—£7,500 for the electricity undertaking.

Ince U.D.C.—£17,700 for a sewage disposal scheme.

Irvine T.C.—£11,050 for the erection of workmen's houses.

Loughrea R.D.C.—£8,250 for a sewerage scheme.

Prestwich U.D.C.—£20,515 for the construction of the Deyne Valley intercepting sewer.

Stratford-on-Avon T.C.—£646 for a new road.

Watford R.D.C. £950 for the erection of workmen's houses.

FORTHCOMING INQUIRIES.

FEBRUARY.

	£
22.—**Bognor.** For the provision of workmen's houses (Mr. Courtenay Clifton)	1,928
23.—**Blackpool.** For private street works (Mr. F. H. Tulloch)	2,347
23.—**Felixstowe.** For the extension of the sewage pumping station and destructor (Mr. A. G. Deuny)	1,880
23.—**Portland.** For the provision of a steam tractor (Mr. W. O. E. Meade-King) ...	663
23.—**Reigate.** For hospital extension (Mr. W. W. E. Fletcher)	2,850
23.—**Silsdon.** For street improvement (Mr. R. H. Bicknell)	130
24.—**Denton.** For works of surface-water drainage (Mr. R. H. Bicknell)	2,000
24.—**Leyland.** For works of water supply (Mr. F. H. Tulloch)	1,283
25.—**Farnworth.** For works of paving (Mr. F. H. Tulloch)	5,376
25.—**Nantyglo.** For the erection of a bridge and public conveniences, and street improvement (Mr. H. Shelford Bidwell)	3,748
25.—**Tamworth.** For the provision of houses (Mr. H. A. Chapman)	15,000
26.—**Bedwas.** For works of water supply (Mr. H. Shelford Bidwell)	2,150
26.—**Hendon.** For the purchase of a motor fire engine (Mr. M. K. North)	1,240
26.—**Prestatyn.** For the provision of a public convenience (Mr. F. H. Tulloch)	320
26.—**St. Germans.** For works of sewage disposal (Mr. W. O. E. Meade-King) ...	950
27.—**Paignton.** For works of road widening (Mr. W. O. E. Meade-King)	920

TOWN PLANNING.

25.—**Beckenham.** (Mr. George L. Pepler) ...	

MARCH.

2.—**Bexhill.** For the erection of an isolation hospital (Mr. W. W. E. Fletcher) ...	6,500

HOUSES FOR DOCK WORKERS.

PORT OF LONDON AUTHORITY'S SCHEME.

At Prince Regent's-lane, Plaistow, the Port of London Authority has initiated a housing scheme for dock workers which, as being a pioneer movement, is likely to have an important influence upon housing plans taken in hand by public authorities in the future.

The scheme is the immediate outcome of the huge extensions of the Port of London sanctioned by Parliament a few years ago. This comprised the extension of existing docks, and the construction of new ones. In all, the cost bore an initial estimate of £15,000,000; but before its completion is reached this figure—big though it is—may easily be exceeded. Such a large scheme could not be carried out in the Metropolitan Dock district without disturbing existing housing accommodation, and is bound to be accompanied by a demand for new housing room by those who will find permanent employment in the new docks, the first section of which, at a cost of £4,000,000, is now in course of construction. To meet these necessities the Port of London Authority has put this pioneer scheme in hand.

The plans now decided upon provide for 204 houses, giving accommodation to about 1,000 persons. In the original plans 164 houses were arranged for; but forty houses have been added, because it was found necessary to rehouse families at North Woolwich whose residences are being demolished. Street and sewering work is now well in hand, and the construction of the houses and the general laying-out of the estate upon Garden City lines will be carried out as quickly as possible. When completed, just over twelve months hence, this colony of 204 houses will constitute the first model Dockers' Garden Suburb in the kingdom. The houses will contain three, four, or five rooms. The surrounding and intersecting roads are 40 ft. wide, with frontages to the houses of 15 ft. A bath is provided in each house. In front and rear garden plots are provided for.

While the White Hart-lane estate of the London County Council accommodates twenty-six persons to the acre, the Prince Regent's-lane estate will contain only twenty-two houses to the acre. The rents are not yet fixed; but they will be similar to those charged for similar house-room in the locality, and preference is to be given to persons who are being dishoused as a result of the Port of London extensions.

Running Costs of Motor Vehicles.—A paper on this subject will be read before the Society of Engineers on Monday, March 1st, by Lieut. Robert W. A. Brewer, Assoc.M.Inst.C.E., A.M.I.Mech.E. The meeting will be held at the Institution of Electrical Engineers, and the chair will be taken at 7.30 p.m.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the most important projected works of which particulars appear below: Building.—Plymouth, Stoney, Bromley and Town planning.—Finchley, Southam and Pembroke roads and materials.—Fleetwood, Kensington, Rubble crushers.—Swinton and Pendlebury, Hunslet, Wrexham, water, gas and electricity.—Perth, Prestwich, Tredegarpe.—Particulars of other projected works will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Acton U.D.C.—The council propose to widen the railway on each side of the bridge at Friar-street and upon the suggestion of the surveyor, Mr. F. Sebert, negotiations are to be opened up with the railway company with respect to the widening of the bridge.

Blackpool T.C.—The council have submitted plans to the Local Government Board for a sanatorium at Staining.

Blairgowrie T.C.—Consideration is being given to a proposal for alterations to the public hall.

Carlisle T.C.—A scheme has been approved for the erection of a technical school.

Ealing T.C.—The borough surveyor, Mr. W. R. Hicks, has received instructions to prepare plans for a school to be erected on St. Mary's allotments.

Newcastle-on-Tyne T.C.—At a meeting of the Estate and Property Committee, a communication was read from the Local Government Board desiring to be informed why the corporation proposed to proceed with the erection of three new baths, at a cost of £29,000, at the present time, contrary to the opinion expressed by His Majesty's Treasury respecting the expenditure of public money during the war.

Plymouth T.C.—Messrs. Thornely, Beedle & Barron, architects, have received instructions to prepare plans for the extension of the asylum at Blackadon. The estimated cost of the work is £[illegible].

Shrewsbury T.C.—A scheme has been agreed to for the addition of a block to the isolation hospital.

Stepney B.C.—Another step has been taken in connection with the proposed new municipal buildings, it having been agreed to issue an advertisement for suitable designs. No guarantee is given that the council will proceed with the erection of the buildings within a definite period.

Westhampnett R.D.C.—With regard to the proposal for substituting steel bridges for the existing bridges which cross the Chichester Canal at Donnington and at Birdham, the Road Board have written that they regretted they were unable, at the present time, to encourage the authorities concerned to make an application for a grant from the Road Improvement Fund towards the expenditure proposed, nor any applications in respect of works such as the construction of bridges, for which the money could be borrowed from outside sources, and the repayments spread over a considerable number of years.

HOUSING AND TOWN PLANNING.

Bridgwater R.D.C.—The surveyor, Mr. W. A. Collins, has prepared amended estimates for the housing scheme, and the council have applied to the Public Works Loan Commissioners for a loan of £854 for the purchase of land and the erection of cottages.

Dublin T.C.—Tenders are to be invited for the erection of workmen's houses in Church-street, Beresford-street, and Trinity Ward.

Finchley U.D.C.—It has been agreed to build 100 workmen's houses at North Finchley.

Glasgow T.C.—The city council are giving consideration to a scheme prepared by the master of works, Mr. A. B. McDonald, for the erection of workmen's dwellings at Govan.

Holmfirth U.D.C.—It is intended to carry out a housing scheme at an estimated cost of £3,285.

Newton Abbot U.D.C.—A committee has been appointed to prepare a scheme for the erection of twenty workmen's dwellings.

Penzance T.C.—The tender of Messrs. H. [illegible] & Sons, of Crowan, at £4,946, has been accepted for the erection of twenty-two workmen's houses.

Swinton and Pendlebury U.D.C.—Approval has been given to a scheme for the erection of workmen's dwellings, at an estimated cost of £7,400.

Torrington T.C.—A tender has been accepted for the erection of [illegible] at a cost of £1,027.

PARKS AND OPEN SPACES.

Morecambe T.C.—The council have approved a scheme prepared by the borough surveyor, Mr. F. W. Hipwood, for laying out golf links.

REFUSE COLLECTION AND DISPOSAL.

Bournemouth T.C.—Provision is to be made in the [illegible] for the removal of house refuse.

ROADS AND MATERIALS.

Acton U.D.C.—It has been resolved to meet the Hammersmith Borough Council by paying part of the purchase of the land and the works, to the extent of £315, in connection with the construction of the proposed new road connecting Old Oak Common-lane with Old Oak Common.

Brighton T.C.—The Improvements and Highways Committee recommend that an improvement be carried out at the Grand Parade, at an estimated cost of £[illegible].

Cuckfield R.D.C.—It has been decided to obtain 2,700 [illegible] of tarred stone; and about 1,500 tons of Groby, Mountsorrel and Croft granite; also 180 tons of screenings from Messrs. Read & Sons, Dinogar Quarries, and to accept tenders for 300 tons of dug flints and for 70 tons of Portfield gravel.—The council have confirmed the action of the highways surveyor, Mr. W. McArthur, in accepting ninety barrels of tar from the Haywards Heath Gas Company for next season's work at 6s. [illegible].

Epsom R.D.C.—It has been decided to widen portion of Barrdon lane at an estimated cost of £200.

Exmouth U.D.C.—The tender of Messrs. Wilkinson & Co., at £[illegible], has been accepted for the second section of the Marine-drive improvement, subject to the sanction of the Local Government Board being obtained to the substitution of reinforced concrete piles for wood piles.

Fleetwood U.D.C.—The surveyor, Mr. E. Frobisher, has prepared a scheme of foreshore improvement which is estimated to cost from £15,000 to £20,000.

Harwich T.C.—The council have approved the scheme of the borough surveyor, Mr. F. H. French, for making up Clarke's-road, Dovercourt.

Hythe T.C.—The council have submitted to the county council a scheme for treating certain roads with Tarmac, at an estimated cost of £[illegible].

Isle of Wight R.D.C.—The council have agreed to a scheme for [illegible] and repairing the road leading from Freshwater to Chale. The surveyor stated that the Road Board would repay the council the whole of the cost incurred, and advance the money by instalments as required, and that he had been asked to include in his estimate 2½ per cent for the use of plant and tools, 5 per cent for contingencies and drainage, and 5 per cent for supervision and establishment expenses. After completion of the work no future liability would rest on the council for the maintenance of the road.

Kensington B.C.—The Works Committee recently reported that they had given further consideration to the wood-paving question, and had had before them a report by the borough engineer, Mr. A. R. Finch, in which he stated that, having made a survey of the whole of the wood paving in the borough, he had come to the conclusion that for the next four years the following might be regarded as a conservative estimate of the probable expenditure of the council on wood paving renewals, if the borough standard of wood-paved surfaces is to be maintained: For the year 1915-16, £20,440; 1916-17, £17,223; 1917-18, £19,220;

and 1918-19, £24,143. It was recommended that the following roads should, if possible, be renewed during the ensuing financial year: Brompton-road, from the Bell and Horns public-house to the borough boundary by Hoopers-court, estimated cost £8,100; Young-street, £1,900; and Holland-road, £12,150. The matter has been referred back to the committee for the purpose of deleting Holland-road.

Kidderminster T.C.—It is proposed to make up the streets in the added area, at an estimated cost of £12,000.

Lancs C.C.—The Road Board have approved of thirty-four schemes of road improvement in the county, suitable to be put in hand when relief work were required in the various districts.

Leyburn R.D.C.—The Road Board have sanctioned a grant of £200 towards the cost of widening the road to Downholme.

Limerick C.C.—The Local Government Board have written to the council in connection with the lack of money for the maintenance of main roads, stating that the board would approve of the expenditure of £1,500 on such work. The council have agreed to accept the offer.

Maidstone T.C.—The corporation have purchased 25,000 second hand Jarrah wood blocks for paving their High-street tramway.

Manchester T.C.—The Paving Committee have received the council's authority to effect private street improvements at a cost of £402.

Morecambe T.C.—A scheme for the extension of the promenade and also the tramway system has been approved.

Northumberland C.C.—It has been decided to carry out improvements to a large number of dangerous corners in the county, at an estimated cost of £7,168, subject to a grant being obtained from the Road Board.

St. Pancras B.C.—A grant of £1,868 has been received from the Road Board in respect of the cost of wood paving in Leighton-road. This amount brings up the board's contributions to £4,868, out of a certified cost of £5,162.

Sheffield T.C.—It is proposed by the Improvement Committee to acquire property in Exchange-street and Furnival-road for widening purposes, at a cost of £14,900.

Stoke-on-Trent T.C.—The scheme for widening and diverting Stonecroad is to be carried out at an estimated cost of £2,483.

Tipton U.D.C.—The surveyor, Mr. W. H. Jukes, has submitted to the Road Board certain schemes, including a proposal to tarspray a much larger area of the main roads than heretofore. He has also submitted an estimate for strengthening the foundations of No. 2 main road from Dudley Port Station to the parish boundary at Great Bridge, 1,353 yds. in length, the total estimate for the work being £1,738. It is proposed to take off the present metal and screen it for re-use, and then to excavate the whole of the carriageway to a depth of 16in. A foundation of under pitching, 9 in. deep, is to be put in, and then 3 in. of broken slag, and the top 4in. to be of granite metal in two sizes. This, when completed, will, the surveyor considers, make a first-class permanent road.

Westhampnett R.D.C.—The tender of Messrs. Rowe & Mitchell, London and Guernsey, has been accepted for the supply of 2,200 tons of 2-in. Guernsey granite at prices ranging from 11s 5d to 16s 9d per ton according to place of delivery.

SEWERAGE AND SEWAGE DISPOSAL.

Atherstone R.D.C.—Negotiations are in progress for the purchase of 5½ acres at Baddesley for sewage disposal purposes.

Elgin C.C.—Mr. Doig, engineer, is preparing a scheme for the disposal of the sewage of New Elgin.

Ellesmere U.D.C.—The Local Government Board having inquired what steps are being taken with respect to sewage disposal, the council have referred the matter to the General Purposes Committee.

Galashiels T.C.—A statement was submitted recently showing that the cost of the drainage and sewage disposal scheme was £70,753. The principal items were: Messrs. Shanks & M'Ewen, contractors, £47,000; engineers' fees and outlays, £4,684; Messrs. Thos. Hill & Co., £4,621 (purchase price of cement), £4,250.

Harrogate T.C.—The council have decided upon a scheme for the duplication of the 21-in. and 24-in. syphons in connection with the south main outfall sewer, at an estimated cost of £5,530.

Hebburn U.D.C.—It has been agreed to carry out sewer extensions at an estimated cost of £772.

Midsomer Norton U.D.C.—A notification having been received from the county council of their intention to take proceedings against the urban council under the Rivers Pollution Prevention Acts, a committee has been appointed to consider the question of an improvement in the method of sewage disposal.

Norwich T.C.—It has been decided to purchase a Rees Roturbo pump, electric motor, and motor starter, for the sewage works, at a cost of £76.

Wrexham R.D.C.—A scheme for the drainage of the new garden suburb at Gresford is to be carried out at an estimated cost of £3,900.

WATER, GAS, AND ELECTRICITY.

Basford R.D.C.—The clerk has been authorised to approach the Local Government Board with a view to extending the Cossall water supply to Newton Bridge.

Battersea B.C.—The Electricity Committee recommend the council to give effect to the proposal of the electrical engineer for an extension of the equipment at the generating station, and the provision of other machinery. They also suggest the desirability of linking up the electricity undertaking with that at Fulham.

Bourne R.D.C.—It has been agreed to instal at the new isolation hospital a system of "Cox's air gas," which was stated to be cheaper at an installation cost of £200 than a supply of coal gas from the Bourne gasworks.

Chichester T.C.—Objection having been raised to the recommendation of the Lighting Committee that the council should claim the standards under the electric light contract at the end of the year, it was explained by the chairman of the committee that the terms of the agreement enabled the council to claim the columns and lamps "if the corporation so desired," and the time had arrived, in the opinion of the committee, when it would be an advantage to decide that the columns should become the property of the corporation, because they were new and up-to-date, and convertible for gas or electricity, and because they would be able to get a lower tender for street lighting by having their own standards. Some 320 standards at £2 each were included in the previous tender, and whoever had the tender after December 31, 1915, the cost would be at a lower rate. In addition, they did not wish to have the pavements disturbed. The council approved the recommendation.

Hackney B.C.—It has been resolved to link up the electricity undertaking with that of the Poplar Borough Council, at an estimated cost of £2,720.

Hull T.C.—The nett profit of the water undertaking last year was £18,862.

Llandudno U.D.C.—A scheme has been approved for the extension of the gas-making plant at an estimated cost of £7,600.

Midsomer Norton U.D.C.—The surveyor, Mr. C. H. Sunderland, reported lately that he had gone into the question of lighting the street gas lamps wholly by hand and partially by hand and controllers. The cost of lighting the lamps for the lighting season 1913-14 was £34 17s 11d (exclusive of the cost of gas and repairs to lanterns). To light the whole of the gas lamps by hand at the present rate paid would be £45.

Perth T.C.—It has been decided to instal a new turbo-generator at the electricity works, at an estimated cost of £6,000.

Prestwich T.C.—Consideration is being given to a proposal for the provision of increased water storage and filtering.

Tanderagee U.D.C.—The council are considering in committee a report by Messrs. Swaine & Considine, consulting engineers, recommending a scheme of water supply from the Glenoran springs, at an estimated cost of £5,000.

Thakeham R.D.C.—In connection with the Storrington water supply scheme the council have accepted the tender of Messrs. William Moss, Loughborough, at £2,403, for the construction of the reservoir and

...ing the house, the tender of the Stanton Ironworks Nottingham, at £1,221, for iron material and the tender of Tangye, Limited, Birmingham, at £56, for the supply of oil engines and pumping plant.

Torquay T.C.—The following tenders have been accepted for new plant at the generating station: Motor-driven sea-water pump, Messrs. Rees Returbo Company, £248; overhead travelling crane, Messrs. Herbert Morris, Limited, £184; all steel work in connection with the coal transporter at the works, Messrs. T. L. Harding & Sons, £95; all switchgear, the British Thomson Houston Company, £1 464.

Upton U.D.C.—The tender of Messrs. Childs & Withers, at £5,915, has been accepted for the Upton-on-Severn water supply scheme.

MISCELLANEOUS.

Truro R.D.C.—Upon the suggestion of the surveyor for the Northern Division, Mr. S. Gilbert, it has been agreed to ask the Local Government Board to sanction borrowing out of rates by the council.

Plymouth T.C.—The council have accepted the tender of the British Electrical Engineering Company for the supply of six motor cars and trailers at £750 each, and that of the British Westinghouse Electric and Manufacturing Company for the electrical equipment of the cars, and application is to be made to the Board of Trade for sanction to borrow £4,500 for the purchase of the cars.

PERSONAL.

Mr. Thomas Scott, Old Cumnock, has been appointed burgh surveyor of Dunbar.

Mr. Walter Hine has been elected [illegible] engineer to the Ramsbridge Rural District Council.

Mr. C. V. Drummond has been appointed by the London County Council as district surveyor for Bermondsey.

Mr. Arthur W. Kemp, a well-known and popular figure in road motoring circles, has been appointed [illegible] of the Hendon Motor Construction, Limited.

Messrs. J. Bass, H. West, J. C. Tanner, H. Whittaker, P. J. Purchase, and F. G. Pitts, of the Herts county surveyor's staff, are each to receive part of a sum of £300 voted by the county council for special services rendered or to be rendered during the illness and absence of the late county surveyor.

Mr. Sherard Cowper-Coles, M.I.Mech.E., M.I.E.E., has been elected a vice-president of the Society of Engineers, filling the vacancy caused by the death of Mr. T. E. Bower last year; and Mr. Burnard Geen, Assoc.M.Inst.C.E., has been elected a member of council in place of Mr. Cowper-Coles.

Lieutenant W. Crabtree, of the 8th (Service) Battalion Lincolnshire Regiment, who died as the result of a motor accident near Tring recently, was the only son of the late Mr. W. H. R. Crabtree, a former borough surveyor of Doncaster, and nephew of Mr. W. R. Crabtree, surveyor to the Doncaster Rural District Council.

Second Lieutenant Richard Twelvetrees, A.M.I.Mech.E., A.M.Soc.E. (France), was gazetted Lieutenant on January 20th last. Lieutenant Twelvetrees, who is a staff officer in the Mechanical Transport branch of the Army Service Corps, has been on active service with the British Expeditionary Force since last October.

Mr. G. A. Hart, sewerage engineer, Leeds, on the 12th inst. delivered the second of a series of two Friday evening lectures on the municipal undertakings of that city, arranged in connection with the local Philosophical and Literary Society. The subject of the lecture was "Sewage Disposal." Tonight Mr. W. T. Lancashire, the city engineer, will speak on "Town Planning."

Mr. A. T. Walmisley, M.I.M.E., at the invitation of the Committee of Management of the International Engineering Congress, 1915, to be held at San Francisco, has written the twelfth article of a series on "Materials of Engineering Construction" which is being published in connection therewith. The subject he was specially asked to deal with is the "Use of Iron and Steel Structures."

Mr. Michael Murphy, [illegible] borough surveyor of Dublin, recorded a [illegible] on the occasion of a complimentary gathering at the Dolphin Hotel, at which a large party representative of all departments of the corporation employees assembled. A resolution of congratulation was passed to him on the proposition of Mr. Henry Allen, seconded by Mr. Howe, and Mr. Moynihan replied in appropriate terms. Though having first claim to preferment, Mr. Allen had, said Mr. Moynihan, waived it in favour of himself.

THE CARE OF ROADSIDE GRIPS.

DAMAGES FOR PERSONAL INJURIES.

At the Petersfield County Court on Monday, his Honour Judge Gye delivered judgment in the case of Ann Masters, of Causeway Farm, Horndean, against the Hampshire County Council, which had been heard at three previous sittings, two at Petersfield and the last at Winchester on December 23rd. The action was brought by the wife of a farmer who broke her leg on March 3rd in consequence of falling into a grip by the side of the road near the tramway [illegible] at Horndean. She claimed £40 from the county council, the road authority in the district in which the accident occurred, alleging that the defendants were guilty of a breach of their statutory duty, and were negligent by permitting the grip to be overgrown with grass.

His Honour remarked that several decisions dealing with the question at issue were cited on both sides. He had carefully considered all these, but he thought that it was sufficient to refer specifically to one of them only—viz., the *Borough of Bathurst* v. *Macpherson*, in which the law on the point was very fully considered. Following the judgment of their lordships in that particular case, he had no doubt that upon applying what was there laid down the plaintiff was entitled to recover damages from the defendants in respect of the injuries which she sustained. He found as a fact that the defendants were clothed with the duty to repair, and keep in repair, the roadway and the grip at the place where the accident happened. That duty [illegible] with the duty of cutting and trimming the grass at the roadside, and cleaning those grips and keeping them clear from grass; that the grip into which the plaintiff's foot slipped was covered with grass to such an extent that it could not be seen by the plaintiff under the circumstances of the accident in question; that its condition was due to the defendants' breach of their duty and negligence in their capacity as the road authority; that the plaintiff was not guilty of any contributory negligence, but was entitled to assume that she could safely approach [illegible] she in fact did; that the accident to the plaintiff was caused solely by the defendants' breach of duty and negligence above mentioned. He gave judgment [illegible] and costs.

Mr. W. H. Hanscombe, representing the county council, reminded his Honour that at the last hearing he said he would agree to a stay for three weeks, and if notice of appeal was served till the hearing. He presumed that held.

His Honour concurred.

Herts County Road Scheme.—A new scheme of road making and maintenance was decided upon by the Herts County Council at their last meeting. What the council proposes to do is to establish a depot of their own for the supply of materials for the roads, to acquire a fleet of motor lorries for the distribution of material throughout the county, and to do the work by direct labour. The cost of the depot, which is to be situated at Hatfield, is estimated at £7,500, plus the site, £2,400; and there are to be eight rubber-tyred motor lorries (two for the exclusive use of outlying districts), which will cost £6,400. The total capital expenditure is therefore £14,000, which is to be borrowed for a short term of five years. "Shrewd observers," the *Herts Mercury* comments, "will no doubt associate the scheme with the recent changes in the county surveyor's department, and it may perhaps be regarded as the first instalment of a series of departmental developments which the wide experience of Mr. Killick, the new county surveyor, will qualify him to carry into effect."

CLYDEBANK TOWN-PLANNING SCHEME.

LOCAL GOVERNMENT BOARD INQUIRY.

Mr. J. Walker-Smith, M.INST.C.E., on Monday held an inquiry on behalf of the Scottish Local Government Board regarding the proposed town planning scheme of the Clydebank Town Council. Mr. George Ross, the burgh surveyor, stated that the land suitable for town planning totalled 2,680 acres, of which 1,424 were within the burgh and 1,256 within the eastern district of the county; 729 acres of the latter were within the parish of Old Kilpatrick, and 527 acres in the parish of New Kilpatrick. The amount of undeveloped land in the proposed town planning area was 1,660 acres, 478 being in the burgh and 1,182 outwith the burgh. He expressed the opinion that the whole area which it was proposed to town plan could be developed in thirty years. In some parts of the burgh there was an average of 120 houses to the acre. In the Fifth Ward, where the population was most dense, the figure was 615 per acre. In other parts it varied from 77 to 177 houses per acre, and 394 to 599 per acre. Taking the whole area of land already developed within the burgh, including parks and open spaces and the three large public works, there were 422 acres, with 8,730 houses, which gave the average of 20 houses and 102 persons per acre.

Provost Taylor, who also gave evidence, said the corporation's idea of a town plan was that each local authority should have a belt of land round its own area, which it would be allowed to town plan; otherwise the Town Planning Act would not be of much account. He thought they had been extremely reasonable; they had not taken a very large belt of land, and only land that was close to them. They thought they should have the right to say what roads and what type of buildings should be erected there. According to the ratio of the development of Clydebank during the past thirty years, he anticipated that in another thirty years the population—estimated at present to be 44,741—would be 150,000.

The Civic Engineer's Who's Who, compiled by the editor of The Surveyor and Municipal and County Engineer, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier.*

FOR OTHER ADVERTISEMENTS

See End of Paper.

HAVERHILL URBAN DISTRICT COUNCIL.

SUPPLY OF ROAD MATERIAL.

Tenders are invited for the supply of Broken Granite, Slag, and Slag Tar-macadam. Forms of Tender and particulars may be obtained from the undersigned, to whom Tenders, with samples, must be delivered on or before March 15, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

JOHN H. CLARKE,
Surveyor.

Haverhill,
Suffolk.
February 17, 1915. (2,388)

URBAN DISTRICT OF FINCHLEY.

TAR FOR ROAD SURFACE TREATMENT.

The Council of the above-named District invites Tenders for the Supply, in barrels, to the various Depots within its District, of about 55,000 gallons of Tar, in such quantities and at such times as may be ordered by its Engineer, the Council also to have the option of increasing the quantity up to 70,000 gallons, at the price quoted.

The Specification may be obtained on application to the Council's Engineer and Surveyor, Mr. C. J. Jenkin, M.INST.C.E., at the Council Offices, Church End, Finchley.

Sealed Tenders, endorsed "Tar," to be addressed to the undersigned, and delivered not later than 12 (noon) on Wednesday, the 3rd March, 1915.

The Council does not bind itself to accept the lowest or any Tender.

E. H. LISTER,
Clerk of the Council.

Council Offices,
Church End,
Finchley, N.
February 17, 1915. (2,387)

BOROUGH OF NUNEATON.

ANNUAL CONTRACTS.

Tenders are invited for the supply of the undermentioned Materials during the twelve months ending the 31st March, 1916:—

1. Blue Bricks, Kerbs, &c.
3. Disinfectants and Soap.
4. Earthenware Pipes, &c.
5. Granite Kerbs and Setts.
6. Iron Castings.
7. Iron, Hardware, &c.
8. Petroleum.
9. Portland Cement.

Conditions of Contract and Forms of Tender may be obtained on application at my office, and sealed Tenders, endorsed "Tenders for Supplies," must be delivered to me not later than 9 o'clock a.m. on Tuesday, the 2nd prox.

The Corporation do not bind themselves to accept the lowest or any Tender.

F. C. COOK, Assoc.M.Inst.C.E.,
Borough Surveyor.

Municipal Offices,
Nuneaton.
February 17, 1915. (2,389)

COUNTY BOROUGH OF STOKE-ON-TRENT.

SEWAGE DEPARTMENT.

The above Council invite Tenders for the supply of the following Goods to the several Sewage Works in the Borough for the year ending 31st March, 1916:—

1. Press Cloths.
2. Lime.
3. Chemicals.
4. Coal and Slack.
5. Petroleum for Power Purposes.
6. Lubricating Oils.

Full particulars, together with Forms of Tender, may be obtained from the Office of Mr. W. H. Makepeace, Sewage Engineer, Leek-road, Stoke-on-Trent, on or after Monday, 22nd February, 1915.

Contractors will be required to agree to the fair wage clause of the Corporation.

Tenders, endorsed "Tender for ——, Sewage Department," must be sent to me, the undersigned, not later than Monday, 8th March, 1915.

The Council does not bind itself to accept the lowest or any Tender.

E. B. SHARPLEY,
Town Clerk.

Town Hall, Stoke-on-Trent.
February 15, 1915. (2,391)

THE FINSBURY BOROUGH COUNCIL invite Tenders for the undermentioned Supplies, &c., from 31st March next:—

For Three or Six Months—

Fodder,* Peat Moss Litter,* and Timber.

For Six or Twelve Months—

Brooms, Scavenger and Machine.*	Pitch and Creosote Oil.
Castings.	Portland Cement and Lime.
Chandlery.	Sand, Ballast, &c.
Clinker, &c., Disposal of*	Stable Accessories.*
Disinfectants.	Stoneware Goods.
Electric Fittings.*	Tools and General Plant.*
Granite.	Wood Paving Blocks.
Horse and Cart Hire.	York Paving and Patent Stone.
Paints, &c.	

Particulars and Forms of Tender may be had any day save Saturdays, from 10 to 4, and on Saturdays from 10 to 12, on application to the Borough Surveyor at the Town Hall, except that in the case of items marked with an asterisk similar application should instead be made to the Chief Cleansing Inspector, 26 Wharf-road, City-road, N. Postal requests must be accompanied by a stamped and addressed foolscap envelope. Tenders, marked outside "Fodder," or as the case may require, must be delivered to me at this Town Hall not later than Noon on Monday, 1st March prox. Only those made upon the Official Form and properly filled up and signed, and confined to the articles specified therein, will be entertained.

GEORGE WHITEHEAD PRESTON,
Town Clerk.

Finsbury Town Hall,
Rosebery-avenue, E.C.
February 16, 1915. (2,390)

REDUCED PUBLIC LIGHTING.

WHITENING OF EDGES OF STREET KERBS.

During the present [illegible] engineer and surveyor to the Finchley Urban District Council, and Mr. Vincent B. Collins, M.Inst.C.E., the assistant engineer, to consider methods [illegible]

[illegible] the street orderly men, and these men have to lime-wash the [illegible] a steam wagon so as to perform this work in the following manner:—

[illegible] man follows the steam wagon and directs the hose to the [illegible] spread of the spray to the margin requiring whitening. The [illegible] being about 3 miles an hour when in full work; the average speed is reduced to about 2 miles an hour, the loss being due to the time occupied in taking out the empty lime-wash containers and substituting full ones. The whole adaptation has been effected without [illegible] the special requirements.

Public Health Law. This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the general subject only for its purpose in holding [illegible] highways but omitting [illegible] students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.

Council School Spray Baths. In the House of [illegible] it was proposed to instal spray baths in the basement of a projected new council school at Abertillery, and that these were objected to on account of their position [illegible] quite satisfactory; and whether, before finally condemning proposals for spray baths in the basements [illegible] said the Board of Education do not object to the installation of spray baths in the basement of a school building, but it was necessary for them to satisfy themselves that the ventilation and lighting were adequate. This was not the case as regards the baths [illegible] for this reason that the board were unable to approve [illegible]

ROYAL SANITARY INSTITUTE.

MANCHESTER MEETING.

At a meeting of the Royal Sanitary Institute to be held at Manchester to-night (Friday), a discussion on "The Construction of Sewers," which will be illustrated by lantern slides, will be opened by Mr. S. S. Platt, M.Inst.C.E., borough engineer of Rochdale, and on "Housing from the Sanitary Inspector's Standpoint," by Mr. H. Dryland, of the Manchester Sanitary Department.

The chair will be taken at 7 o'clock by Sir Henry Tanner, C.B., I.S.O., F.R.I.B.A.

To-morrow the chairman of the Rivers Committee of the corporation, Alderman Frowde, has kindly consented to arrange for the members to inspect an interesting section of the Manchester main drainage scheme.

* "A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities." By S. G. Turner, of the Middle Temple, Barrister-at-Law. A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

INSTITUTION OF MUNICIPAL ENGINEERS.

[illegible] Mr. W. H. Martin [illegible] Engineer and Surveyor, Chester.

The next meeting of the council will be held in London on Friday, February 26th.

[illegible]

39 Victoria-street, S.W.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

ASSISTANT HIGHWAY SURVEYOR. [illegible] 22nd.—Williton Rural District Council. £90 a year.—Mr. Frank Risdon, clerk, Williton, Taunton.

CHIEF OFFICIAL OF PARKS. [illegible] 22nd. [illegible] J. L. Wheatley, town clerk.

CLERK OF WORKS.—February 23rd.—Rathmines [illegible] Chairman, Town Hall.

CLERK OF WORKS.—February 24th.—Littlehampton Urban District Council. £3 per week.—Mr. A. Shelley, clerk.

CLERK OF WORKS.—February 24th.—Wrexham Rural District Council. £2 10s. per week.—Mr. G. V. Price, interim clerk.

COUNTY SURVEYOR. [illegible] 24th. County Council of Notts. £750 per annum and travelling expenses.—Mr. H. Hampton Copnall, clerk, Shire Hall, Nottingham.

SUPERINTENDENT OF HIGHWAYS.—March 1st.—Corporation of Oxford. £180—£200 a year.—Mr. W. H. White, city engineer, Town Hall, Oxford.

BOROUGH SURVEYOR'S ASSISTANTS.—March 1st.—Corporation of Stockport. £2 5s. per week, [illegible] draught-men.—Mr. John Atkinson, borough surveyor.

ROAD FOREMAN.—March 1st.—Durham County Council. 50s. per week.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

SURVEYOR'S ASSISTANT.—March 1st.—Seisdon Rural District Council. £65 per annum.—Mr. William Cannan, engineer and surveyor, Surveyor's Office, Wombourne, Staffs.

GENERAL FOREMAN.—March 2nd.—Teddington Urban District Council. £104—£120.—Mr. Marshall Hainsworth, surveyor, Elmfield House, Teddington.

SURVEYOR OF HIGHWAYS.—March 25th.—Abingdon Rural District Council. £2 10s., to a maximum of £150.—Messrs. B. & E. M. Challoner, clerk, 67 Stert-street, Abingdon.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

ASSISTANT.—Romford Rural District Council. £120 per annum.—Mr. W. J. Grant, surveyor, 16A South-street, Romford.

DRAUGHTSMEN.—Sierra Leone Government, Public Works Department. £300—£350.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

SANITARY ENGINEER.—For an English firm in India.—"Sanitary," c/o Deacon's, Leadenhall-street, London, E.C.

DRAUGHTSMAN.—Nigerian Government Railway. £300—£350 per annum.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

BRADFORD.—March 31st.—Designs for the replanning of streets, for the corporation.—The Town Clerk.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

ATHERSTONE.—February 22nd.—For the erection of a public convenience, for the rural district council.—Mr. H. J. Cobley, engineer and surveyor.

BRADFORD.—February 22nd.—For the erection of a destructor, for the corporation.—City Architect.

GLASGOW.—February 22nd.—For the erection of two lavatories, for the corporation.—Mr. J. Lindsay, town clerk.

LEYTON.—February 23rd.—For the construction of underground conveniences, for the urban district council.—Mr. Ernest H. Essex, Town Hall, Leyton.

ST. HELENS.—February 23rd.—For the erection of a refuse destructor, for the corporation.—Mr. A. W. Bradley, borough engineer.

OLDHAM.—February 24th.—For the erection of an accumulator stores, for the Electricity Committee.—Borough Surveyor.

LUTTERWORTH.—February 24th.—For the erection of seven houses, for the rural district council.—Mr. A. J. Ross, surveyor.

HULL.—February 24th.—For the construction of a urinal, for the corporation.—Mr. F. W. Bricknell, acting city engineer.

HUDDERSFIELD.—February 25th.—For the erection of a pavilion, for the corporation.—Mr. W. Cooper, architect, 1 Kirkgate Buildings, Huddersfield.

SHEFFIELD.—February 25th.—For the extension of engine-room and boiler-house and the erection of switch-rooms and stores, for the Electric Supply Committee.—Mr. S. E. Fedden, general manager, Commercial-street, Sheffield.

GLASGOW.—February 27th.—For the erection of public halls, for the corporation.—Office of Public Works, 64 Cochrane-street.

CASTLEREA.—February 27th.—For the extension of the waterworks, for the rural district council.—The Clerk.

MENAI.—March 1st.—For the construction of a reservoir and laying mains, for the urban district council.—Mr. W. Owen, waterworks engineer, Dale-street, Menai Bridge.

DUNDEE.—March 1st.—For the construction of the foundations of the new city hall, for the corporation.—City Architect.

SOMERSET.—March 1st.—For the erection of a school, for the county council.—Messrs. Jane & Fry, architects, Waterloo-street, Weston-super-Mare.

HERTS.—March 1st.—For additions to a school, for the county council.—County Surveyor, Hatfield.

ESSEX.—March 1st.—For the reconstruction of Wickford Bridge, widening of roadway, pointing of ironwork, and removing existing bridge, for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

STOCKPORT.—March 1st.—For the erection of a refuse destructor, for the corporation.—Mr. J. Atkinson, borough surveyor.

HUDDERSFIELD.—March 2nd.—For the erection of a tuberculosis hospital at Bradley Gate, for the corporation.—Mr. K. F. Campbell, borough engineer.

BARNSLEY.—March 4th.—For the erection of a new town hall, for the corporation.—Town Clerk.

HUDDERSFIELD.—March 4th.—For the construction of a filter-house, for the corporation.—Waterworks Engineer, Town Hall.

KENT.—March 4th.—For the erection of a medical officer's house at the county asylum, for the Asylums Committee.—Engineer, County Asylum, Barming Heath, near Maidstone.

WORSLEY.—March 5th.—For the erection of a pump-house, for the urban district council.—Mr. J. Howard, surveyor.

TREDEGAR.—March 15th.—For the erection of a caretaker's lodge at the cemetery, for the urban district council.—Mr. W. Lloyd Roach, surveyor.

NORTHAMPTON.—March 25th.—For the erection of twenty cottages, for the corporation.—Waterworks Office, Fish-street, Northampton.

Iron and Steel.

EVESHAM.—February 22nd.—For the construction of about 3 miles of water mains, valves, hydrants, air valves, meter, and necessary chambers in connection therewith, for the rural district council.—Messrs. Wilkes & Rankes, Union Chambers, 63 Temple-row, Birmingham.

MANCHESTER.—February 23rd.—For the supply of galvanised steam pipes, for the corporation.—Superintendent, Markets Department.

CHEPPING WYCOMBE.—March 6th.—For the supply of galvanised tubes, lab and stop cocks, and valve and stopcock boxes, for the corporation.—Mr. T. J. Rushbrooke, waterworks engineer, Easton-street, High Wycombe.

PLYMOUTH.—March 9th.—For the supply of cast-iron pipes, for the corporation.—Mr. F. Howarth, city engineer.

Roads.

MARPLE.—February 22nd.—For the supply of granite macadam and chippings, Macclesfield macadam and chippings, limestone macadam and chippings, 6-in. setts, and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor, Council Offices, Marple.

HIGHWORTH.—February 22nd.—For the repair of roads and hauling materials, for the rural district council.—Mr. O. Kimber, surveyor, Kite Hill, Wanborough, Wilts.

DONCASTER.—February 22nd.—For road improvement works, for the rural district council.—Mr. W. R. Crabtree, surveyor, Union Offices, High-street, Doncaster.

HARROGATE.—February 22nd.—For the supply of road materials, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

PENARTH.—February 22nd.—For the supply of mountain limestone, road metalling and gravel, basalt or granite gravel, for the urban district council.—Mr. E. I. Evans, surveyor.

MANSFIELD - WOODHOUSE.—February 22nd.—For the reconstruction of upwards of 2 miles of road, for the urban district council.—Mr. F. P. Cook, surveyor.

PENYBONT.—February 22nd—26th.—For the construction of new roads, for the rural district council.—Mr. E. Jenkins, surveyor, Nolton-street, Bridgend.

HENDON.—February 22nd.—For making up certain roads, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

EPSOM.—February 22nd.—For the supply of road materials, for the rural district council.—Mr. T. E. Ware, surveyor.

HEMSWORTH.—February 23rd.—For making up a certain street, for the rural district council.—Mr. T. H. Richardson, Hemsworth.

SMALLBURGH.—February 23rd.—For the supply of road materials, for the rural district council.—Mr. W. L. Lewis, district surveyor, Stalham.

SOUTHALL-NORWOOD.—February 23rd.—For the supply of 3,000 tons of tarred slag-macadam, and repairing road surface, for the urban district council.—Mr. Reginald Brown, engineer and surveyor.

WILLESDEN.—February 23rd.—For making up a certain street, for the urban district council.—Mr. O. C. Robson, engineer.

LONDON.—February 23rd.—For the supply of granite setts, for the county council.—Chief Officer, London County Council Tramways, 62 Finsbury-pavement, E.C.

MALLING.—February 23rd.—For the supply of road materials and tar, for the rural district council.—Mr. J. Marshall, highway surveyor, Springetts Hill, East Malling.

WEALDSTONE.—February 23rd.—For the supply of gravel, hoggin, and cartage, for the urban district council.—Mr. H. Walker, surveyor.

SOUTHAMPTON.—February 23rd.—For the execution of private street works, for the corporation.—Borough Engineer.

SURREY.—February 23rd.—For the supply of steam rollers and water carts, for the county council.—Mr. A. Dyland, county surveyor, County Hall, Kingston-upon-Thames.

RUSHDEN.—February 24th.—For the supply of granite and slag, for the urban district council.—Mr. W. E. Madin, engineer and surveyor.

MUTFORD.—February 24th.—For making up two roads, for the rural district council.—The Surveyor.

RICHMOND.—February 24th.—For making up certain roads, for the corporation.—Mr. J. H. Brierley, borough surveyor.

ROCHDALE.—February 24th.—For making up a road, for the corporation.—Borough Surveyor.

FULHAM.—February 24th.—For paving certain roads, for the borough council.—Mr. F. Wood, borough surveyor.

DESBOROUGH.—February 24th.—For the supply of broken granite, slag and gravel, for the urban district council.—Mr. T. F. Parker, deputy surveyor.

HOLLINGBOURNE.—February 24th.—For the supply of road materials, for the rural district council.—Mr. H. J. Bracher, clerk, 33 Earl-street, Maidstone.

WHITLEY.—February 25th.—For steam rolling and carting, and the supply of granite and dross, for the urban district council.—Mr. J. Sharp, clerk, 23 John William-street, Huddersfield.

BOSMERE AND CLAYDON.—February 25th.—For the supply of granite, picked stones, and pit stone, for the rural district council.—Mr. R. M. Cook, clerk, 20 Providence-street, Ipswich.

SHEPTON MALLET.—February 25th.—For road maintenance and the supply of materials, for the rural district council.—Mr. J. Neish, surveyor.

BRIDGNORTH.—February 25th.—For the supply of granite, basalt, and slag, for the rural district council.—The Surveyor, Oldbury, Bridgnorth.

HORNSEY.—February 26th.—For cartage work and street watering, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

MERTON.—February 26th.—For the paving of certain footpaths, for the urban district council.—Mr. G. Jerram, surveyor.

SALISBURY.—February 26th.—For the supply of stones, gravel and haulage, for the rural district council.—Mr. D. W. Morrice, district surveyor, Homington.

SOUTH SHIELDS.—February 27th.—For excavating and laying in situ concrete for footways and back streets, for the corporation.—Mr. L. Roseveare, borough engineer and surveyor.

LANCS.—February 27th.—For the hire of steam rollers during the year ending March 31, 1916, or for a period of three years, for the county council.—Mr. W. H. Schofield, County Offices, Preston.

STRETFORD.—February 27th.—For making up certain streets, for the urban district council.—Mr. E. Worrall, surveyor.

LLANDAFF.—February 27th.—For the supply of mountain limestone and team labour, for the rural district council.—Mr. J. Holden, surveyor.

DARTFORD.—February 27th.—For the supply of road materials, haulage, and tar-painting, for the rural district council.—Mr. J. Hoskins, surveyor.

CAMBS.—February 27th.—For the hire of steam rollers for use on the main roads during the year ending March 31, 1916, for the county council.—Mr. H. H. Dunn, acting county surveyor, County Hall, Cambridge.

LANCS.—February 27th.—For the supply of granite macadam, tarred slag or granite macadam, limestone macadam, rubble, chippings, and gravel, for the county council.—Mr. W. H. Schofield, county surveyor, County Offices, Preston.

DENBIGH.—February 27th.—For the supply of road stone, chippings or screenings, tar-macadam, and tar-topping, for the county council.—County Surveyor, Wrexham.

STRETFORD.—February 27th.—For paving in rock asphalt and sewering certain roads, for the urban district council.—Mr. Ernest Worrall, surveyor.

EAST RETFORD.—March 1st.—For the supply of slag, granite, refined tar and Tarvia, for the rural district council.—Mr. T. Henry, surveyor.

LICHFIELD.—March 1st.—For the supply of granite, slag, tools, chippings and carting, for the rural district council.—Mr. T. Moseley, clerk.

EAST GRINSTEAD.—March 1st.—For the supply of materials, for the rural district council.—Mr. F. S. White, clerk.

CORNWALL.—March 1st.—For the supply of materials and hauling, for the county council. Assistant County Surveyor, Clinton-road, Redruth.

UCKFIELD.—March 1st.—For the reconstruction of a road, for the urban district council.—Mr. W. H. Overton, engineer and surveyor.

SLEAFORD.—March 1st.—For the supply of 1,000 tons of broken granite, for the urban district council.—The Surveyor.

SAWBRIDGEWORTH.—March 1st.—For street watering for the ensuing season, for the urban district council.—Mr. W. Morris, clerk.

CRAMLINGTON.—March 1st.—For the supply of road material, cartage, and hire of steam roller and water cart, for the urban district council.—Mr. J. Coulson, surveyor.

DURHAM.—March 1st.—For the hire of steam rollers and steam tractor hauling plants, for the county council.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

SEVENOAKS.—March 1st.—For the supply of road flints, ragstone, granite, quartz, basalt, steam rolling, team labour, cartage and haulage, for the rural district council.—Mr. F. H. Vibert, clerk, Bank Chambers, 82 High-street, Sevenoaks.

HERTS.—March 1st.—For the hire of steam and petrol rollers, for the county council.—Mr. J. S. Killick, county surveyor, Hatfield.

MILTON.—March 2nd.—For the supply of surface-picked flints, pit flints, fine gravel, broken granite, Kentish rag, and horse labour, for the rural district council.—Mr. E. C. Pearcy, district surveyor, 45 High-street, Sittingbourne.

WOODBRIDGE.—March 2nd.—For the supply of granite or basalt broken to pass through a 2½-in. and to be rejected by a 1½-in. gauge, whole chalk flint, Washmill flint, Kentish rag, and other road material, for the rural district council.—Mr. George Cook, district surveyor, Ipswich-road, Woodbridge.

CASTLE WARD.—March 2nd.—For the supply of road materials, for the rural district council.—Mr. D. Hope, surveyor, Ponteland.

WARDLE.—March 2nd.—For the supply of granite setts, for the urban district council.—Mr. J. D. Hurst, surveyor.

ELLAND.—March 3rd.—For making up a certain road, for the urban district council.—Mr. P. H. Whitwam, surveyor.

POTTERSPURY.—March 3rd.—For the supply of granite and slag, for the rural district council.—Mr. J. B. Fairchild, Potterspury, Stony Stratford.

LOUGHBOROUGH.—March 3rd.—For the supply of broken granite, for the corporation.—Mr. A. H. Walker, borough surveyor.

CUDWORTH.—March 3rd.—For the supply of 1,000 tons of tarred slag, 250 tons of granite, and 500 tons of slag, for the urban district council.—Mr. W. T. Lynam, surveyor.

BINGHAM.—March 3rd.—For the supply of granite and slag, for the rural district council.—Mr. J. W. Mason, clerk.

BELPER.—March 6th.—For the supply of granite, furnace slag, and limestone, for the rural district council.—Mr. R. C. Cordon, engineer and surveyor, Duffield, near Derby.

DRIFFIELD.—March 6th.—For the supply of flint-stone, granite, broken slag, sea cobbles, sea gravel, and tarred chippings, for the rural district council.—Mr. T. Casson Beaumont, surveyor.

WINCHESTER.—March 6th.—For the supply of broken granite and chippings, and concrete paving slabs, for the corporation.—Mr. Walter V. Anderson, city engineer.

STAFFS.—March 6th.—For the supply and cartage of road materials, for the county council.—Mr. J. Moncur, county surveyor, Stafford.

NEWARK.—March 6th.—For the supply of 900 tons of granite, 1,800 tons of slag, 150 tons of tar-macadam, and 200 gallons of tar, for the rural district council.—Mr. A. J. Franks, clerk.

LEAMINGTON.—March 8th.—For the supply of 3,000 tons of road stone, for the corporation.—Road Surveyor, Adelaide-road.

WING.—March 8th.—For the supply of 800 tons of granite, and 1,200 tons of slag, sand and gravel, for the rural district council.—Mr. M. G. Gurney, surveyor.

CHORLEY.—March 8th.—For the supply of road materials, for the rural district council.—Mr. P. Whalley, highway surveyor, High-street, Chorley.

FOLESHILL.—March 9th.—For the supply of granite, for the rural district council.—The Surveyor.

WEST SUFFOLK.—March 15th.—For the supply of local stone, gravel, tools, surface tarring, and the hire of steam rollers, for the county council.—Mr. W. Lionel Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

CHAILEY.—March 18th.—For the supply of flints, quartzite, Kentish rag, Mendip stone, and gravel, for the rural district council.—Mr. H. Kemp Walls, district surveyor, North Common, Chailey.

KIVETON PARK.—March 20th.—For the supply of broken slag, granite and tar-macadam, for the rural district council.—Mr. F. Hewitt, surveyor.

DROXFORD.—March 29th.—For the supply of 1,250 tons of granite or hard stone, for the rural district council.—Mr. J. King, surveyor, Droxford, Hants.

CULHAM.—For the supply of 350 tons of Clee Hill and other stone, for the rural district council.—Mr. B. Challoner, clerk, Stert-street, Abingdon.

ABINGDON.—For the supply of 4,000 tons of road stone, for the rural district council.—Messrs. Challoner, clerks, Stert-street, Abingdon.

DISS.—For the supply of granite, for the urban district council.—Mr. A. Cooper, surveyor.

Sanitary.

MANSFIELD WOODHOUSE.—February 22nd.—For the removal of nightsoil, for the urban district council.—Mr. J. E. Alcock, clerk.

CHERITON.—February 22nd.—For the removal of house refuse, for the urban district council.—Mr. A. Atkinson, acting clerk.

WAKEFIELD.—February 22nd.—For the construction of a concrete culvert in tunnel, for the corporation.—Mr. J. P. Wakeford, city surveyor.

WOKING.—February 22nd.—For the construction of three screening chambers and detritus tanks, three sedimentation tanks, fifteen circular bacteria beds, provided with automatic distributors, six humus tanks, various lengths of effluent carriers, engine-house, sludge pump and press-house, and engine-houses for driving screens and pumping humus, and other works, for the urban district council.—Mr. G. Midgley Taylor, Caxton House, Westminster, S.W.

SEATON DELAVAL.—February 23rd.—For scavenging No. 14 district, for the urban district council.—The Surveyor.

KNOTTINGLEY.—February 23rd.—For extensions of main sewers, for the urban district council.—Mr. A. Hartley, consulting surveyor, Town Hall.

EPSOM.—February 23rd.—For the removal of house refuse, for the rural district council.—Mr. F. A. Pratley, surveyor.

ST. ALBANS.—February 24th.—For providing and laying new sewers, for the rural district council.—Mr. H. F. Mence, surveyor, 11 St. Peter's-street, St. Albans.

HAMPTON WICK.—February 26th.—For road watering and scavenging, for the urban district council.—Mr. H. Fawsett, clerk.

GRIMSBY.—February 27th.—For the removal of refuse, for the rural district council.—Mr. J. H. Evans, sanitary inspector.

ROTHERHAM.—February 27th.—For the removal of nightsoil and other refuse, for the rural district council.—Mr. B. Hey, surveyor.

DARTFORD.—March 1st.—For supplying and laying stoneware pipes, manholes and appurtenant works, for the rural district council.—Mr. J. Hobbs, engineer, 2 Lowfield-street, Dartford.

HORNSEY.—March 1st.—For the construction of pipe sewer and manholes, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

WHITEHAVEN.—March 1st.—For the construction of sewers, manholes, flushing tanks, and outfall tank for the rural district council.—Mr. G. Boyd, 33 Queen-street, Whitehaven.

LICHFIELD.—March 3rd.—For carrying out a sewerage scheme at Watling-street, Brownhills, including the laying of 600 yds. of 9-in., and 170 yds. of 8-in. stoneware pipe sewers, and manholes, and constructing disposal works, for the rural district council.—Mr. O. Rawstron, surveyor, The Workhouse, Lichfield.

NEWCASTLE-UPON-TYNE.—March 6th.—For the removal of house refuse, for the corporation.—City Engineer.

CHORLEYWOOD.—March 6th.—For the removal of refuse, for the urban district council.—Mr. W. H. Scott, surveyor.

BURRY PORT.—March 8th.—For the construction of a system of sewerage for the district of Burry Port, comprising cast-iron and stoneware pipe sewers, manholes, lampholes, flushing tanks, ventilating shafts, and other incidental works, for the urban district council.—Mr. A. P. I. Cotterell, 17 Old Queen-street, Westminster, and 28 Baldwin-street, Bristol.

Stores.

BROADSTAIRS.—February 22nd.—For the supply of Portland cement, tools and castings, oils, brushes, stoneware pipes, crushed pebble, tarred limestone, and lime for water softening purposes, for the urban district council.—Mr. Howard Hurd, surveyor.

MANSFIELD.—February 22nd.—For the supply of granite, slag, tar-macadam, natural flags, kerbing, channelling, concrete flags, Portland cement, stoneware pipes, junctions, bends, timber, sewer ironwork, castings, coal, ironmongery, general stores, paints, oils, varnish, brooms, brushes, disinfectants, and harness, for the corporation.—Mr. Thos. P. Collinge, borough engineer and surveyor.

SOUTHALL-NORWOOD.—February 23rd.—For the supply of granite, lime, cement, oil, alumino-ferric, waste, press cloth, disinfectants, tools, picks, shafts, dust-bins, Kentish pit flint, hoggin, gravel, horse hire, steam rolling and scarifying, forage, coal, and coke, for the urban district council.—Mr. Reginald Brown, engineer and surveyor, Town Hall, Southall.

BATTERSEA.—February 24th.—For the supply of materials for cart and van covers, harness material, paints, special paints, enamels, painters' sundries, varnish, tools, ironmongery, granite macadam and chippings, slag tar-macadam, tarred paving material for footpaths, chippings, dust, and gas tar, York paving, Thames ballast and sand, stoneware pipes, timber, bricks, cement, lime, iron castings, iron bars, scavengers' bass brooms and circular bass brooms, disinfectants and oils, for the borough council.—Mr. W. Marcus Wilkins, town clerk.

DESBOROUGH.—February 24th.—For the supply of broken granite, slag, gravel, sanitary pipes, blue bricks and paviors, and Portland cement, for the urban district council.—Mr. T. F. Parker, deputy surveyor.

SOUTHEND-ON-SEA.—February 24th.—For the supply of stoneware pipes, bends, flints, bricks, gravel, sand, timber, ironmongery, paints, oils, colours, cement, lime, chalk, team labour, forage, tar-paving, tar-macadam, iron castings, granite kerb, channel, broken Guernsey granite, broken granite, pitch, creosote oil, harness supplies, sundries, brooms, brushes, steel, iron, and disinfectants, for the corporation.—Mr. Ernest J. Elford, borough engineer.

HAMPTON.—February 25th.—For the supply of hand-broken granite, granite chippings, broken Kentish brown flints, Derbyshire limestone, marble tar-paving material, forage, house coal and coke, and scavengers' bass brooms, for the urban district council.—Mr. Sidney H. Chambers, surveyor, Public Offices, Hampton.

SOUTH SHIELDS.—February 27th.—For the supply of Northumberland whinstone, Fifeshire whinstone, Aberdeen and Norwegian granite, slag, granite chippings, Caithness flags, Portland cement, cement-concrete flags, cast ironwork, shovels, scavengers' leather hose, sewer boots, jackets, sanitary pipes, paints, paint oils, glass, timber, iron, horseshoe nails, cart axles, springs, tar, pitch, oils, and general stores, for the corporation.—Mr. Leslie Roseveare, borough engineer and surveyor.

MIDDLETON.—February 28th.—For the supply of macadam, setts, kerbs, flags, cement, pipes, pitch and oil, and brooms and castings, for the corporation.—Mr. Frederick Entwistle, town clerk, Town Hall, Middleton.

DURHAM.—March 1st.—For the supply of broken whinstone, broken limestone, broken slag, rough slag, tarred slag, distilled and prepared tar, tools, team labour and cartage, tar-spraying, and sanitary pipes, for the county council.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

DERBY.—March 1st.—For the supply of bricks, cement, lime, disinfectants, earthenware, freestone, gritstone, granite, gravel, sand, limestone, pitch, tar, and slag, for the corporation.—Borough Surveyor.

MARYLEBONE.—March 1st.—For the supply of road materials, horses, harness and drivers, Portland cement, oils, stoneware sewers, ironwork for sewers, and slopping, for the borough council.—Mr. J. Paget Waddington, borough surveyor.

MILTON.—March 2nd.—For the supply of surface-dressing flints, per 10 tons (or equivalent quantity), broken granite, kerbing, channel stones, and blue hard paving setts, for the ensuing year.—Mr. [illegible] Surveyor to the Milton Urban District Council.

MANCHESTER.—March 8th.—For the supply of [illegible] and steps, street grids, passage grids, galvanised [illegible] Town Hall, West Didsbury.

SALES.—March 8th.—For the supply of Guernsey or Alderney granite, broken pit flints and [illegible] hire, for the urban district council. Engineer and Surveyor.

EPSOM.—March 9th.—For the supply of ironwork, gully gratings, shovels, picks, brooms, forks, [illegible] broken granite, chippings and limestone dust, tar-paving and tar-macadam, coal and coke, hay, corn, bran, straw, bricks, paraffin, artificial stone paving, Thames ballast, Thames sand, veterinary surgeon's services, tar, pitch, and team labour, for the urban district council.—Mr. Edward R. Capon, surveyor, Bromley Hurst, Church-street, Epsom.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted † Recommended for acceptance

BLYTHE.—For the supply of [illegible] G. L. [illegible]

[illegible]	
Eastlaw & Co., Limited, [illegible]	£
Stanford Tar Co., Limited, [illegible]	
Gourley & [illegible]	
P. S. [illegible]	
Mansfield and Sheffield [illegible] Limited, Sheffield	
J. Cook & Sons, [illegible]	
Lodge, Abbott & Lockwood, Limited, Sheffield	
Sussex *	

GOSFORTH.—For [illegible] surveyor:

J. [illegible]	
T. S. Hedley & Son, Ryton	
J. C. McShane, Ltd., Low Fell	
Elliott Brothers, Newcastle-on-Tyne	
J. T. Mellor, Newcastle-on-Tyne	
W. Robson, Gosforth	
W. C. Fleck, Gosforth	
R. & A. P. Tait, Seaton Delaval	

GOSFORTH.—For making up certain roads for the urban district council.—Mr. C. Nicholson, engineer and surveyor.

J. W. Renderson, Gosforth	£	£
W. Tulip & Son, Gosforth		
P. Edgar, Gosforth		
J. Maclaren, junr., Gosforth		
G. E. Simpson, Newcastle-on-Tyne		

GRAYS THURROCK.—Accepted for the supply of 400 tons of basalt or granite chippings for the urban district council.—Mr. A. C. James, surveyor.

Underby and Stoney Stanton Granite Company, Limited, Leicester, 9s. 11d. per ton delivered by rail.

GREAT TORRINGTON.—For the removal of cottages and the erection of five dwelling-houses, for the corporation.—Mr. W. C. Medland, borough surveyor.

F. Cann, Bude, North Cornwall	£1,350
T. Bowden & Sons, Torrington	1,097
A. Darch, Torrington *	1,027

LITTLEHAMPTON.—Accepted for the erection of an isolation hospital, and of public lavatories, for the urban district council.—Mr. H. Howard, surveyor.

Isolation Hospital.—Linfield & Sons, Limited, Littlehampton, £2,741.

Public Conveniences.—Linfield & Sons, Limited, Littlehampton, £968.

NORFOLK.—The following tenders have been accepted by the Eastern Highways Committee of the county council:—

Tools.—E. Langford & Co., Lane, W. R. Pollard, East Harling; Thorns & Co., Norwich.

Gullies and Frames.—Morton & Turner, Kenninghall Youngs & Co., Diss.

Lynn.

[illegible]

[illegible]

650 tons best quality Whatwick granite.

[illegible] flint.

C. W. Parker, Bradwell-on-Sea.—800 tons red flint.

PORTSMOUTH.—For extensions to infectious [illegible] hospital, Milton, for the corporation.—Mr. Arthur [illegible]

Lavington, Limited	£
[illegible]	26,897
[illegible]	26,200
[illegible]	
[illegible]	
S. Salter, Southsea	
[illegible]	
[illegible]	
[illegible]	24,400

SHEFFIELD.—Accepted for the widening of High Bridge, Penistone road, for the corporation.—City Engineer:—

[illegible]

[illegible]

[illegible]—For the erection of six cottages, for the [illegible]

[illegible]	£
[illegible]	1,500
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	

MEETINGS.

Societies [illegible] by sending early notice of [illegible] meetings.

FEBRUARY

[illegible]

Institution of Civil Engineers.—Mr. H. E. Yerbury on [illegible]

MARCH.

[illegible]—Mr. C. Reece on the Bermudas: The Drainage of Hamilton, Bermuda." Caxton Hall, Westminster. 8 p.m.

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON TUESDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of tenders. Such [illegible] may, in case of emergency, only, be telephoned (City No. 1046) subject to later confirmation by letter.*

CUDWORTH URBAN DISTRICT COUNCIL.

TO STONE MERCHANTS.

Tenders are invited for the supply and [illegible] Materials:—

About 1,000 tons Tarred Slag.
About [illegible] tons Granite.
About 500 tons Slag.

Further Particulars and Form of Tender can be obtained from W. T. Lyreon, Surveyor, Council Offices, Cudworth, upon receipt of [illegible] addressed envelope.

Sealed Tenders, endorsed "Tender for Road Material," and Samples of same to be addressed to the Clerk to the Council, Council Offices, Cudworth, on or before Wednesday, March 3, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

W. E. RALEY,
Clerk to the Council.

Council Offices,
Cudworth, near Barnsley.
February 16, 1915.

DURHAM COUNTY COUNCIL.

AUCKLAND AND CHESTER MAIN ROAD DISTRICT.

TENDER FOR MATERIALS AND TAR-SPRAYING.

The Works Committee invite Tenders for the supply of the undermentioned Materials, Stores, &c., for the year ending 31st March, 1916:—

(1) Broken Whinstone.
(2) ,, Limestone.
(3) ,, Slag.
(4) Rough Slag.
(5) Tarred Slag.
(6) Distilled and Prepared Tar
(7) Tools.
(8) Team Labour and Cartage.
(9) Tar-spraying.
(10) Sanitary Pipes.

Specification and Form of Tender may be obtained on application to the undersigned, to whom sealed Tenders, suitably endorsed, are to be delivered on or before the 1st March, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

ALBERT E. BROOKES,
County Surveyor.

Shire Hall,
Durham.
February 8, 1915. (2,385)

DURHAM COUNTY COUNCIL.

AUCKLAND AND CHESTER MAIN ROAD DISTRICT.

STEAM ROLLING.

The Works Committee invite Tenders for the Hire of Steam Rollers and Steam Tractor Hauling Plants for use in the above or other Districts in the County where the roads are directly maintained by the County Council for the year ending March 31st, 1916, or for a further period of two or three years.

Specification and Form of Tender may be obtained on application to the undersigned, to whom sealed Tenders, suitably endorsed, are to be delivered on or before the 1st March, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

ALBERT E. BROOKES,
County Surveyor.

Shire Hall,
Durham.
February 8, 1915. (2,384)

(Continued on p. xvii.)

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

COUNTY OF DURHAM.

APPOINTMENT OF ROAD FOREMAN

The County Council of Durham invite applications for the position of Road Foreman in the Auckland and Chester Main Road District.

Applicants must have had practical experience in the construction and repair of paved and macadamised roads, in the supervision of manual and team labour, and in keeping time and materials accounts.

He will be required to work the same hours as the workmen, and to reside at an approved centre within the district.

The commencing wages will be 50s. per week, with an allowance of 3s. per week for use of a bicycle.

Applications, in candidate's own handwriting, giving full particulars of previous experience, stating age, and accompanied by not more than three recent testimonials, to be sent to the undersigned not later than 1st March, 1915.

ALBERT E. BROOKES,
County Surveyor.

Shire Hall,
Durham.
February 10, 1915. (2,383)

SEISDON RURAL DISTRICT COUNCIL.

SURVEYOR'S ASSISTANT.

Applications are invited for the appointment of Temporary Assistant in the Engineer and Surveyor's Department.

Applicants must be good Draughtsmen, with a good knowledge of Surveying, Levelling, Building and Drainage Inspection, and the general work of a Surveyor's Office. Salary at the rate of £65 per annum, with bicycle.

Applications, in candidate's own handwriting, endorsed "Surveyor's Assistant," stating age and experience, accompanied by copies of not more than three recent testimonials, and giving the date on which the applicant can take up his duties, must be received by me not later than Monday, the 1st March, 1915.

WILLIAM CANNAN,
Engineer and Surveyor.

Surveyor's Office,
Wombourne.
February 12, 1915. (2,369)

TWO DRAUGHTSMEN required for the Sierra Leone Government, Public Works Department. Salary £300—£10—£350. Free first-class passages and quarters. Liberal leave in England on full salary. Age 25—35. Candidates should have had considerable experience in architectural and engineering draughting, and should have held a responsible position in the drawing office of an Architect and Surveyor, or Civil Engineer in good general practice. Neat and expeditious draughtsmen. They should also have had experience in control of a drawing office staff, and be capable of getting out designs and details of buildings, including steel frame work, bridges and other works, with some experience in architectural design. Should be well up in building construction and in the preparation of specifications, bills of quantities, and estimates.

Candidates should apply at once, by letter, giving full particulars of experience, &c., to the Crown Agents for the Colonies, Whitehall-gardens, London, S.W. (2,364)

SANITARY ENGINEER (fully qualified) required for India by an English firm of General Engineers with large Works having several departments, to take charge of their Sanitary Department. Must have had a sound practical and business training, and be able to conduct correspondence, make up plans and estimates, and secure orders, and carry out to completion Sanitary Contracts, taking charge of foremen, plumbers, &c.

A knowledge of Septic Tank Installations and Minor Sewage Disposal Work generally is essential.

Contracts for the Sanitary work of Hospitals, Native Palaces, and other buildings are carried out in different parts of India, which will necessitate some travelling.

A good salary, with five years' agreement, passage both ways, will be given to a well-educated, experienced Engineer with good address.

Age from 30 to 35 years; bachelor preferred.

Application to be made in own handwriting, stating experience, age, if married or single, with copies of any testimonials, to "Sanitary," c/o Deacon's, Leadenhall-street, London, E.C. (2,372)

RURAL DISTRICT OF ABINGDON.

APPOINTMENT OF SURVEYOR OF HIGHWAYS, &c.

The Council of the above district is prepared to receive applications for the appointment of Surveyor of Highways. The District comprises 24 parishes with about 90 miles of district roads.

The salary will be £130 per annum, rising by annual increments of £2 10s. to a maximum of £150.

Forms of application will be forwarded by the undersigned on receipt of a stamped addressed foolscap envelope, and must be returned to us on or before the 25th prox.

Canvassing of the Councillors is strictly prohibited, and will be deemed a disqualification.

(By order)
B. & E. M. CHALLENOR,
Clerks to the Council.

67 Stert-street,
Abingdon. (2,351)

SECRETARIAL CLERK (Male) wanted. 22-30. Civil Engineer's Office, Westminster. £120. Only copies of testimonials to be sent.—Apply Box 1,506, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,363)

JENKINS BROS.

MADE IN CANADA. **VALVES.**

CAST IRON AND GUN METAL.

FIG. 142.

Globe Wheel Valves, all shapes and sizes, Screwed and Flanged. With Jenkins Renewable Discs. Disc Removing Lock-Nut. Back Seating Attachment. Glands can be repacked when under full pressure.

FIG. 106.

Every Valve tested to 300 lbs. Hydraulic Pressure.

FIG. 300.

"TYPE K" FULLWAY VALVES.

Elliptical in design, no sharp corners, Double-Wedge, Gates close with Ball Joint Action, and cannot jam or stick.

FIG. 402.

JENKINS BROS., LTD.,

Dept. E.,

95 QUEEN VICTORIA STREET, LONDON, E.C.

Works: MONTREAL, Canada.

Calno

Reg.d

THE ONLY FIRE-RESISTING FIBRE

BUILDING BOARD

MADE IN

GREAT BRITAIN

Does not Split or Crack. Bound with Cement Binder. Tensile Strength over 300 lb to the square inch.

TESTED AND CERTIFIED by the BRITISH FIRE-PREVENTION COMMITTEE.

PASSED by the L.C.C.

Fire and Damp Resisting.

Germ and Sound Proof.

Non-conductor of heat or cold.

Sanitary.

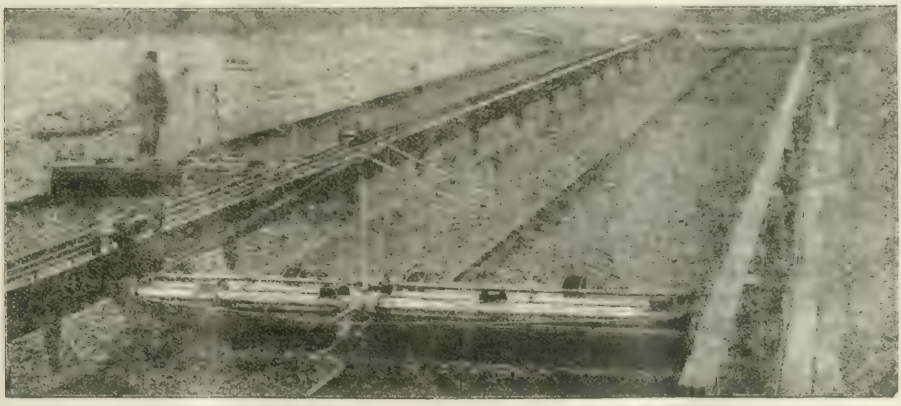
Over 5,000,000 (five million) Square Feet in use by H.M. Government.

Address Dept. D, **Thames Mills, Purfleet, Essex**

THE FIREPROOF FIBRE BUILDING BOARDS, LTD.,

26 Hart Street, London, W.C.

"J. & A." Patent Sewage Sprinklers



As Fixed at Oldham Corporation Sewage Works.

No Wind Troubles, No Complicated Mechanism, No Small Holes to Get Choked and Low Cost of Maintenance Guaranteed.

Write to-day for Illustrated Booklet Series S2.

Jones & Attwood, Ltd., Hydraulic Engineers, Stourbridge.

Telegraphic Address—"HEAT, STOURBRIDGE." Telephone No. 10.

URBAN DISTRICT COUNCIL OF TEDDINGTON.

APPOINTMENT OF GENERAL FOREMAN.

The Council invite applications for the appointment of General Foreman.

Applicants must be between 30 and 45 years of age. Practical experience essential in the construction and maintenance of roads, sewers, paving, and other Municipal works, the keeping of the necessary wages and stores books. The duties will also include the supervision of the Council's horses.

Salary £104 per annum, rising by annual increments of £4 to a maximum of £120, the appointment to be subject to one month's notice on either side.

The person appointed will be required to reside at the Council Offices and act as Caretaker; an extra allowance of 5s. per week will be paid for cleaning offices, with free quarters, fire and gas.

No application will be considered unless made upon a Form to be obtained from Mr. Marshall Hainsworth, Surveyor, Elmfield House, Teddington, to be accompanied by not more than three copies of recent testimonials, which will not be returned, and must be received by the undersigned not later than noon on Tuesday, the 2nd March, 1915.

Canvassing, directly or indirectly, any Councillor or Officer of the Council will be a disqualification.

(By order)

G. H. SALMONS,
Clerk.

Elmfield House,
Teddington.
February 15, 1915. (2,380)

COUNTY BOROUGH OF STOCKPORT

BOROUGH SURVEYOR'S ASSISTANTS

The Highways and Sewers Committee is prepared to receive applications for the appointment of a Junior Draughtsman, salary £2 5s. per week, and two Temporary Draughtsmen at £2 2s. per week

Applicants for the position of "Junior Draughtsman" must state whether they are willing to accept the temporary positions.

Applications, in candidate's own handwriting, stating age, qualifications and experience in the routine of a Borough Surveyor's Office, accompanied by copies of two recent testimonials, to be delivered to the undersigned before Monday, the 1st March, 1915, endorsed "Junior Draughtsman," and "Temporary Draughtsman."

JOHN ATKINSON, A.M.Inst.C.E.,
Borough Surveyor.

Town Hall, Stockport.
February 15, 1915. (2,377)

COUNTY COUNCIL OF NOTTS.

APPOINTMENT OF COUNTY SURVEYOR.

The County Council of Notts are desirous of receiving applications for the office of County Surveyor. The person appointed will be required to reside in or near to the Town of Nottingham, and to devote the whole of his time to the discharge of the duties of the office. He will not be allowed to engage in any private practice.

The salary will be £750 per annum, and, in addition, travelling expenses will be paid.

Applications, marked "County Surveyor," with copies of not more than three recent testimonials, must be made upon Forms which will be forwarded by me upon receipt of an addressed foolscap envelope.

The applications must reach me not later than midday on Saturday, the 27th day of February, 1915.

Canvassing is strictly prohibited, and will be deemed a disqualification.

(By order)

H. HAMPTON COPNALL,
Clerk of the County Council.

Shire Hall,
Nottingham.
February, 1915. (2,304)

WANTED, Surveyor, with road-making experience. Preference given to one who has passed Civil Engineer or Inst. Mun. Engineers. State age, salary and experience.—Address Highways Construction, Limited, Finsbury-court, London, E.C. (2,322)

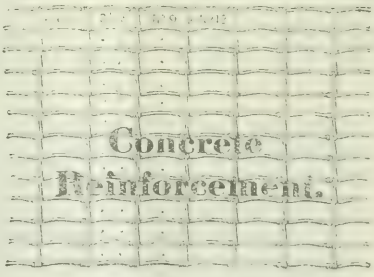
VOIDLESS
ASPHALT MACADAM

Roads constructed with Voidless Asphalt Macadam are dustless, sanitary, waterproof and durable.

The Premier Road for Modern Traffic.

The portable plant enables local labour — and local material where suitable to :: be employed. ::

HIGHWAYS
CONSTRUCTION, LTD.,
FINSBURY COURT, LONDON, E.C.



Stronger Road Beds
and more durable—at less cost

6 inches of Concrete reinforced with "Empire" Reinforcement is stronger than 15 inches unreinforced, and as the cost of the Reinforcement is less than that of 3 inches of Concrete, a saving of at least 6 inches of Concrete is effected by using "Empire" Reinforcement, which is made of hard steel wire which will resist practically any pressure without losing its shape.

"EMPIRE"
ROAD BED REINFORCEMENT

Full particulars and Price List post free from—

PARKER, WINDER & ACHURCH, LTD.,
Broad Street, Birmingham.

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. FEBRUARY 26, 1915. No. 1,206.

Minutes of Proceedings.

Construction of Sewers.

At the meeting of the local Sanitary Institute held at Manchester on April last Saturday last. The discussion was opened by a lecture by Mr. S. S. Platt, engineer to the Sewerage Committee of Rochdale. A great portion of the ground covered by the lecturer was necessarily familiar to many of the municipal engineers attending the meeting, but as there were a large number of young engineers and students present this was not a disadvantage from the educational point of view. The numerous slides shown, especially those lent by Mr. de Courcy Meade, M.INST.C.E., giving the details and [illegible] construction of the Manchester main sewers, were particularly interesting and instructive. In the discussion which followed the lecture several speakers dealt with the question of the relative merits of concrete and brick sewers. The leading of the sewers appeared to favour the use of concrete for pipes of 12 in. or a larger diameter, though a few speakers [illegible] for large sewers. Portland cement was preferred. Except on the ground of economy, the [illegible] of vitrified pipes was not favoured. Such pipes were liable to [illegible] and [illegible] as the joints were not reliable and can be thoroughly tested before use. It is not usual to test the quality of concrete in *situ* other than by testing the quality of the cement and the careful inspection of the proportions and nature of the materials used and the mixed. A close examination of the surface of the sewers [illegible] was necessary, but it is obvious [illegible] practical acquaintance with concrete sewers on a large scale that the concrete [illegible] allow of a much more satisfactory test, and will therefore inspire more confidence in their use.

Another point discussed was the method to be adopted in hilly districts, so as to avoid too steep gradients in the sewers and to prevent the accumulation of sewer gas from the lower to the higher levels. While all the speakers were agreed as to the necessity for avoiding as far as possible steep gradients, so as to prevent too great velocities and the consequent erosion in the sewers, they were by no means agreed upon the form of ramp to be adopted or the necessity for traps and valves on the sewers. Many local authorities do not now insist on traps on house drains, and at their best they can only be looked upon as necessary evils. In sewers their use is certainly undesirable, and vent shafts carried to a sufficient height to discharge any sewer gases safely appear to meet all the requirements of the case, while they are [illegible] urged against the use of flap valves and traps.

The amount of storm water to be provided for [illegible] perhaps the most difficult of all the problems with which the sewerage engineer has to deal, and it is [illegible] than in almost any other branch of municipal engineering. When we find two cities so very similarly situated in many respects as London and Liverpool, in which the variation in the amount of storm water to be carried by the main sewers is equal to ¼ in. per twenty-four hours in the one case and 6 in. in the other, it is evident that there is something besides local conditions to account for this great difference. There are [illegible] rainfall which will reach the sewers, but there [illegible] tion, and local conditions are so variable, that the best of them is only approximate, and requires to be used with great care and judgment. The need for using the heavy Accrington engineering or Staffordshire blue brick was questioned by Mr. Cooper. He appeared to consider them unnecessary in the London district, but for durable and sound work a harder brick than the London stock brick or the gault brick is certainly desirable, and would in the long run prove the most

Aberdeen Water Sterilisation.

Whether it would be to the [illegible] general that our leading scientific workers should have the courage of their convictions and demand universal sterilisation of water supplies, or whether a slower and more cautious policy is desirable, the fact is clear that they do look with growing misgiving at untreated waters, and the time may not be far distant when the presence of coli in any drinking water will be considered inadmissible. Dr. Houston tells us [illegible] as to require no purification "there is always the danger to be considered of possible accidental pollution, with no purification process, or an inadequate one, to safeguard the consumer," while in the case of a water the initial purity of which is so doubtful as to call for treatment, "the water being always regarded as potentially dangerous, is always treated as if it were actually dangerous, and therefore delivered to the consumer habitually in a safe condition." It is clear, therefore, that his opinion—which is also that of every other leading authority—is that no water, however pure in its initial state, is absolutely above suspicion

by the time it reaches the service mains, and that it may be made perfectly safe by ordinary simple treatment. The danger of accidental or unexpected pollution is acute at the present time owing to war conditions. One has not far to look for actual examples of polluted supplies, and in the coming year we must expect to find many of our supplies, not excepting London, affected. The value of the new methods of sterilisation is therefore very great, and all advances and new applications of the various methods already in use should be studied.

The case of Aberdeen, dealt with in our last issue, is therefore of great interest and importance. The report, prepared by Dr Matthew Hay, the medical officer of health, and Mr. Cecil H. Roberts, the city water engineer—extracts from which were quoted—was accompanied by a separate report made by Dr. Houston. It describes the successful application of a threefold process—viz., treatment of the water with an excess of lime, storage, and filtration. It is interesting to note the successful result of such collaboration. The cost of a large reservoir sufficient to purify the water by storage was avoided by the use of the lime and by the after-treatment on filters. The use of lime renders both prolonged storage and slow filtration unnecessary, while it sterilises the water. The storage provides a period of contact during which the sterilisation is effected, and also effects the removal by conversion into carbonate or bicarbonate of lime of the excess of lime beyond what is required for the neutralisation of the water. This results from the contact of the water with the carbonic acid in the air. If necessary, further aëration can be given, or the water can be treated with carbonic acid gas, which can be produced artificially and cheaply. It is interesting to note that, if as a result of such treatment the water should contain an excess of carbonic acid, this must of necessity be neutralised when the water passes through the filters, because they will naturally contain a reserve of carbonate of lime. The chief use of the filters is the clarifying of the water by removing all suspended matters. It is also of interest that this water, treated with two parts of lime per 100,000, stored for seven days and filtered, is absolutely free from .coli, and is given a slight degree of hardness which will prevent the corrosion that has hitherto taken place in the iron water pipes. The example of Aberdeen shows very clearly how thoroughly profitable is the [illegible] water supplies.

* * *

Street Accidents and Local Authorities.

In discussing [illegible] issue the extent of the liability of a highway authority, also acting in some other capacity such as sewer authority—for some negligent omission causing injury to some person using the highway, we referred at some length to the case of *Partridge v. Battersea Borough Council*. It may be within the recollection of our readers that in that case the plaintiff was seriously injured owing to a fall from her bicycle caused by its [illegible] with a defective grill. The defendant council were both highway authority and sewer authority, and in the Court of first instance Mr. Justice Horridge held that, although in the former capacity they were not liable for mere nonfeasance, they were so liable in the latter capacity, and substantial damages were awarded. The council appealed, and the Court of Appeal, without expressing any opinion on the legal questions involved, ordered a new trial on the ground that the former trial had been unsatisfactory as regards certain questions of fact. The conclusion of this new trial, the result of which has been awaited with great interest, was reached on Saturday last, when judgment was delivered by Mr. Justice Scrutton.

It is interesting in the first place to observe that the second jury reduced the damages as originally assessed from £1,900 to £755. The question of liability was then argued, and upon that the learned judge held that the defendant council were not liable. In giving judgment, he pointed out that at the second trial, although the jury had found that the grid was in fact broken they had also found that the non-discovery of this by the defendant council did not amount to negligence on their part. They were further of opinion that the primary cause of the accident was that, as originally constructed, the level of the grid was so much below the level of the road as to be dangerous, but that again the council were not negligent in not having discovered the danger. On these findings, the first question that arose for consideration was whether the grid was part of the road or part of the sewer, and this was left to the jury as a question of fact. The jury found that the grid was part of the road, and with this finding Mr. Justice Scrutton expressed his agreement. The next point was that, although the grid had been dangerously constructed when first put down, that had been done by the predecessors of the defendant council, and in the Act by virtue of which the Wandsworth District Board of Works were succeeded by the Battersea Vestry, there were no express words transferring liabilities. The result was that the defendant council had merely done nothing to alter a dangerous grid put down by their predecessors—that is to say that, as highway authority, they were guilty of mere non-feasance, and therefore not liable. Mr. Justice Scrutton commented on the unsatisfactory state of the law by which there is such a fundamental difference between the respective liabilities of highway and sewer authorities, and said that the remedy was fresh legislation, by which the two authorities might be put upon the same footing. The result of the new trial was eminently satisfactory to the council, for whom judgment was entered with the costs of both trials and the appeal.

* * *

Town Planning and the Landowner.

By far the greater part of the literature of town planning is concerned with what may be called, for want of a better expression, the public aspect of the question, and although the interests of the landowner are recognised in a general way as being worthy of great consideration, his particular point of view has not perhaps hitherto received the special attention which it undoubtedly deserves. This is all the more strange, inasmuch as evidence is accumulating to show that there is in reality very little conflict of interest between the owner who wishes to develop his estate with the greatest possible profit to himself and the town planning authority whose first business is to secure development on lines consistent with public interest and amenity. Mr. G. L. Pepler, A.R.I.B.A., whose paper on the "Economics of Town Planning in Relation to Land Development" will be found in another column, being convinced that, unless town planning is economically sound, all its other virtues are of little practical use, asks the question whether it is financially sound as regards land development, his answer being a reasoned affirmative. The mistakes of the past were in great measure due to a too hasty development of estates, following upon the rush to the towns caused by the great industrial revival of the middle of the nineteenth century. Surveyors to-day, however, are able to profit by these mistakes, and fully recognise the necessity for [illegible] scheme in estate development

that further roads, that such a general scheme should include the determination of the routes to be followed by the principal roads, the class of property to be served, and the order in which the several parts of the estate are to be developed. These things in themselves go some way towards a real solution of the town planning problem, and have a recognition by the local owner that the demand for more space and better conditions of living is one that must be met if houses are to be made marketable.

The general principle was well stated by Mr. Pepler when he said that the greater the foresight with which an estate is developed from the commencement, the greater will be the ultimate value. In many cases, however, the well-intentioned owner cannot afford to wait, and is hampered by questions of immediate finance. To meet this difficulty, Mr. Pepler takes advantage of the growing tendency for people to own the houses in which they live, and puts in a plea for co-partnership housing or for the building of houses for sale by estate development companies. Finally, he considered the effect of the Town Planning Act, and concluded that on the whole its effect upon the economics of estate development had been a beneficial one.

The London County Council's Drainage Proposals.

The truce in matters contentious while the war lasts is responsible this week for the withdrawal by the Parliamentary Committee of the London County Council of certain clauses relating to the sanitary equipment of new buildings contained in the Council's General Powers Bill, 1915. The proposals are far-reaching, and it is indisputable that they would have met with strong opposition from the borough councils. They provide (Part III.) that all houses and buildings erected or rebuilt after the passing of the Act shall be provided with drains so constructed as to prevent at all times and under all conditions the flooding of any part of the building from the flowing back of sewage from the drains. Where it was impracticable to construct the necessary drains so as to act by gravitation, pumping or some other means of conveying the sewage from the house might be adopted. It was also provided that if a building was liable to flooding by reason of inefficient drainage, the council might require the owner within a period of not less than twenty-eight days to make alterations of, or additions to, the drainage system, or provide a new system, while he could be called upon to fill in or otherwise discontinue the use of any basement, floor, cellar, or area belonging to the building.

Provision was also made that the council should repay to the owner the expenses of carrying out any of these orders, and that in respect of the basement requirements the council should pay to the owner or occupier reasonable compensation for any injury suffered by reason of the order made upon him. Part IV made it unlawful for any person upon land of which the surface is below the level of 5 ft. 6 in. above Trinity high-water mark, and which is so situated as not to admit of being efficiently drained at all times and under all conditions by gravitation into an existing sewer of the council (whether a building had been previously erected on the land or not) to erect any building or to adapt or use a building for any purpose for which it was not used at the date of the passing of the Act, except with the permission of the council, and subject to such regulations as the council might prescribe. The borough councils are naturally jealous of any threatened interference with their prerogatives, and their practically united contention was that if new powers with respect to drainage could be proved to be necessary they should be in their hands. A conference [illegible] is, but it would be regrettable if, as in this instance, differences arose over the details of a sanitary problem as to the aim and utility of which all the local authorities are probably in agreement.

Reinforced Concrete and Economy.

At the last meeting of the Concrete Institute, Mr. T. A. Watson, ASSOC.M.INST.C.E., read an interesting paper entitled Economy in Reinforced Concrete Construction," in which he made some telling comparisons between the respective costs of brickwork and reinforced concrete for various purposes. The result of the detailed estimates which he submitted was to show that, while great savings can be made on retaining walls, it is generally not economical to employ reinforced concrete for the external walls of buildings, as such walls up to a thickness of 14 in. are cheaper, but that when walls have to be thicker than this reinforced concrete comes in. As under the proposed London County Council regulations nearly all external walls need not exceed 14 in. in a framed building, it is probable that reinforced concrete walls for this purpose will soon cease to be used from the point of view of economy. With regard to the economy of reinforced concrete-framed buildings outside the London area, this is very considerable; inside the London area the London County Council, by their regulations, propose to reduce it as much as possible. There are, however, opportunities to effect savings over a steel-framed building even in London. The latter part of the paper dealt with possible further economies in the cost of reinforced concrete work, and in this connection reference was made to the enormous amount of waste which occurs from the practice of obtaining several designs with prices from specialists. This is a matter upon which we have frequently commented, and we need say no more on the present occasion than that we entirely agree with Mr. Watson that the custom referred to puts an initial charge on reinforced concrete which might be avoided if the architect or engineer would only choose his system, or employ a consulting engineer accustomed to the work to design the reinforced concrete work, and then send out for prices in the usual way.

Fighting Disease.

In times like the present it is obviously imperative that every precaution should be taken to guard against the spread of infectious disease, and it is satisfactory to know that the Local Government Board have lost no time in taking steps to combat the recent outbreak of cerebro-spinal—or spotted—fever, cases of which have been reported from various parts of the country. The board draw attention to the matter in a circular which they have issued this week to the clerks of sanitary authorities and to medical officers of health, the document being accompanied by a revised Memorandum on the disease and the administrative and other measures that should be taken to prevent further outbreaks. The board trust that councils and the medical officers of health will adopt such measures as may be necessary, on the lines indicated in the Memorandum, should any cases of the disease occur in their district. The board particularly draw attention to the importance of the sanitary authority making arrangements for assisting medical practitioners to obtain an immediate diagnosis in suspected cases of the disease, for isolating patients suffering from it, for disinfection, and for the supervision of contacts.

Electrolytic Action on Gas and Water Mains.

By HARRY E. YERBURY, M.INST.C.E.

At a meeting of the Institution of Civil Engineers on Tuesday evening, Mr. Harry E. Yerbury, M.INST.C.E., dealt in a paper with the electrolytic action of return currents in electric tramways on gas and water mains, and discussed means of providing against electrical disturbances.

The paper opens with reference to the systematic study which has been given to the causes of corrosion, and epitomises the theories which have been evolved as a result of this study. The author favours the electrolytic theory, as its effect can be demonstrated. The process is, moreover, in full accord with modern thought, based on the fact that metals have a definite solution pressure, and by the Nernst formula this and an osmotic pressure are all that is required for electromotive force, and hence for corrosion.

Electrolysis may be intensified by an extraneous or leakage current from, say, electric tramways worked, as they invariably are, by an uninsulated track. A case is cited where a protective clause was inserted by a gas company against possible injurious action by such leakage currents. Board of Trade Rules and Regulations, and their revisions, from 1894 to the present date, are criticised. The influence of a leakage current on reinforced concrete is dealt with.

It is assumed that concrete conducts electrolytically, and not like a metal, and cases are recorded where electrolysis has been attributed to an impurity—such as calcium sulphate—which was added to cements of American make to retard quick setting. The seriousness of the mechanical effects due to the products of corrosion is pointed out in connection with reinforced-concrete structures.

The constitution or structure of metals has undoubtedly an influence on the effects of electrolytic action, and white cast-iron has been proved to be less susceptible to corrosion and pitting than grey iron, as it contains less graphitic carbon and silicon. The influence of high percentages of silicon in cast and wrought iron is cited. In the subject-matter of the paper the causes and results of pitting have not been specifically dealt with, apart from general corrosion, and the expression "damage to pipes" is to be understood to mean both local pitting and general corrosion.

The preventive measures proposed by British and Continental authorities in order to reduce the potential differences between tramway tracks and pipes are classified, and a description of the function of a negative booster is given in detail.

Two theoretical diagrams are given to show the working and effect of a booster system as compared with unboosted negative return conductors. Where the rails and the mass of earth are positive to pipes in the vicinity of the track, there can be no danger to pipes in that area, as they are cathodic. On the other hand, danger exists to all pipes and metallic structures—where embedded in soil—which are positive to the rails, as it is the flow of current out of the pipes that has a tendency to cause corrosion and pitting. The danger, however, is nothing like as great as would appear from the theoretical standpoint. Obviously, if the boosted and unboosted return conductors bonded to the rails are kept at or about the same potential, the ideal system as affecting leakage currents is brought about. Assuming that the potential of the rails, at some point where a negative boosted conductor is bonded, is lowered to an abnormal degree, it follows that pipes carrying a leakage current are invited to give up their charge, as the difference of potential is thereby increased.

This fact is appreciated by the Board of Trade, as one regulation stipulates that the direction of the current should be reversed by interposing one Leclanché cell (1·48 volt) if the current is from the pipe to the return, whereas up to 4·4 volts are allowed where the direction of the current is from the uninsulated return to any pipe in the vicinity. Results of actual potential difference and current tests on Sheffield pipes in various parts of the city are shown.

As current density and duration of current are the most important factors in connection with injurious electrolytic action of or on gas or water pipes, potential readings are somewhat misleading, as it is now well known that where a comparatively high difference of potential exists there is as a rule less injurious current passing. This is largely attributable to the counter electromotive force of polarisation. In Sheffield, when the tramway system and generating station have been shut down, differences of potential up to 0·66 volt have been observed on pipes.

Board of Trade regulations in respect to leakage currents can easily be complied with on all tramway undertakings, and are absolutely effective in safeguarding the property of other authorities. As 650 volts are allowed as a generating or transforming pressure, in the author's opinion up to 600 volts could be allowed between overhead conductors and earth, as 10 per cent is often the maximum drop on a tramway system. This increase of voltage would reduce the cost of feeders, and also the heavy currents now dealt with.

Electrical disturbances, apart from return currents, are mentioned, such as electromagnetic and electrostatic induction. Single-phase alternating-current railways are especially troublesome. Telephone-circuit interference is chiefly due to harmonics of such a frequency as to come within the range to which the ear is sensitive. Voltage waves from generators and transformers are usually distorted, and do not vary uniformly according to the sine law. Star-connected alternators with earthed neutral point frequently cause disturbances in neighbouring telegraph and telephone systems, due to the presence of triple-frequency harmonics in the pressure wave.

The interference with telegraphs and telephones is not entirely confined to alternating-current systems, and trouble has been experienced by pulsating direct current set up by the generators or rotary converters. Special study of each individual case is required before a remedy can be applied. It is desirable, however, that in continuous-current generation and distribution the generators should produce a current without appreciable pulsation, and for alternating work generators having a pure sine wave should be used.

The influence of magnetic fields near tramway tracks has not been considered in the paper, as such disturbances only appreciably affect magnetic observatories.

The paper concludes with a summary, and a theory is put forward that incrustation in the bore of pipes is often caused by local electrolytic action. This growth might be started as a speck of rust, thus forming with the iron a galvanic couple, the oxide being electronegative to iron. The electrolyte might be created by the secretions of animalculæ or other acids. This nucleus would then establish a closed circuit, and the growth would continue by the increased bulk of oxide acting as a shell to retain the electrolyte. Iron pipes should be subjected at a proper temperature to a dipping in some bituminastic solution so as to form a tough adherent covering. This appears to be the best preventive against internal and external corrosion or pitting.

The author suggests that a field of research is open to metallurgists to determine whether corrosion of wrought iron and steel is due to local electrolytic couples set up by some internal crystalline arrangement or to thermal or mechanical stresses in manufacture. It appears that cold worked metal is generally anodic, and can be changed to a cathodic condition by annealing. When cold worked and unworked metal are in contact the possibility of an electrolytic couple exists. Alternating stress steel is also a potential cause of corrosion. Metallic connections to the rails, such as bonds from tramway poles and feeder pillars, should be as few as possible, and all pipes should be kept at least 2 ft. from the track. All rail joints should be tested periodically. Where joints are welded, a copper bond is recommended as a precautionary measure in case of a high resistance being set up by a badly welded joint, which resistance in course of time would be intensified by additional oxidation.

Concrete Institute.—At a meeting of this body to be held on Thursday, March 4th, at Denison House, 296 Vauxhall Bridge-road, Westminster, Mr. R. Graham Keevill, A.M.I.MECH.E., will read a paper entitled "Some Notes on Wind Pressure."

The Construction of Sewers.

ROYAL SANITARY INSTITUTE DISCUSSION AT MANCHESTER.

At a meeting of the Royal Sanitary Institute held in the Municipal School of Technology, Manchester, Sir Henry Tanner, C.B., I.S.O., F.R.I.B.A., in the chair, a discussion on the "Construction of Sewers" was opened by Mr. S. S. Platt, M.Inst.C.E., F.G.S., borough surveyor of Rochdale. The audience, which numbered over 150, included Prof. Boulnois (Municipal School of Technology), Messrs. S. S. Platt (Rochdale), F. J. Dixon (Ashton-under-Lyne), J. A. Settle (Bury), J. H. Walters (Congleton), J. B. Nuttall (Heywood), A. J. Price (Lytham), J. B. Cook (Denton), C. H. Cooper (Wigan), T. de Courcy Meade (Manchester), C. E. Wood (Salford), S. E. Bagnall

MR. S. S. PLATT.
Borough Engineer and Surveyor.

(Macclesfield), H. Ellis-de (Swinton), Peel (Bury), H. Dearden (Dewsbury), T. S. Parker (Eccles), W. H. Roby (Abram), and R. H. Worthington (Irlam).

In the course of his introductory remarks Mr. Platt alluded to some special points of practice arising out of his experience of over forty years, and illustrated his remarks with the aid of over fifty lantern slides.

Dealing with circular brick sewers, from 3 ft. diameter to 15 ft., he referred to the necessity of departing from that form in sewers on the combined system, *i.e.*, taking both sewage and rainfall when the minimum flow might not ensure self-cleansing velocities with slack gradients, and thereby necessitate the adoption of the egg-shape form. He pointed out the limitations of circular pipes under such conditions. Illustrations were shown of various forms of egg-shaped sewers of brickwork and concrete tubes. The quality of materials for brick sewers was referred to, including invert blocks of blue Staffordshire metal and granite concrete.

Waterlogged foundations were spoken of, as well as the modes of dealing with these, and the necessity for boarding the bottom of the trench in some circumstances, to support the concrete foundation of the sewer.

Reference was made to where the solid foundation under the sewers was at a considerable depth below the invert—namely, over a recently filled-up valley, or where the excavation was through a bed of peat. In these cases the sewer was carried on a planked or reinforced-concrete foundation supported on piles driven into the solid ground, and in shallow filling supported on concrete reinforced with expanded metal or other similar reinforcement. In shallow beds of peat the peat was removed and replaced with rough concrete or flat bedded rubble surmounted by concrete for the reception of the sewer. Mr. Platt then dealt with sewers in very hilly districts where ramps or syphon drops were introduced to break up the ventilation and prevent sewer gases rising to the upper [illegible] to counterbalance the excess [illegible] a steep gradient.

The details of manholes were referred to, and slides shown of the standardised type in the Manchester main drainage, and especially for the junction of sewers at an ordinary depth with the main at a greater depth. Ventilation shafts at the summit of sewers were next mentioned, and the necessity for the provision of rust pockets at the foot of these shafts to prevent their blockage by rust and so being rendered inefficient was touched upon. The speaker then dealt with tunnelling with and without compressed air, and with and without cast-iron linings in segments as carried out on the main drainage at Glasgow, Manchester and Rochdale.

In all cases, whether cast-iron segments were used or not, it was necessary that any small space intervening between the back of the work and the strata passed through should be completely filled up with liquid lias lime grout injected under compressed air up to 50 lb. or 60 lb. pressure. Where iron segments were used the flanges were made on the inside, and it was necessary, after several lengths of cast-iron lining had been placed in position, to line it up with a concrete and brick lining to form the inside of the [illegible]

[illegible] Manchester main drainage had been excavated with timber supports by the aid of compressed air without iron linings, these latter only being used where the strata [illegible] specially treacherous nature. Slides were shown of the work at different stages of the Manchester main [illegible]

In Glasgow there were instances of where iron segments were used in tunnel without the use of compressed air through strata consisting of muddy clay [illegible] ring of the segments at a time (18 in. wide), and the precaution taken of keeping the face constantly on the move, excavating and building one ring at a time, and the men standing on the last ring built and never on the ground itself.

SEWERS UNDER RIVERS AND CANALS.

Reference was made to the necessity at times of carrying sewers under rivers and canals, and the special requirements in such cases. The sewer was generally executed in cast-iron pipes surrounded with [illegible] and in the case of canal crossing further enveloped near the bottom of the waterway and its sides by puddled clay.

Mr. Platt spoke of a specially interesting piece of work carried out at Rochdale to enable a sewer to be carried under a canal embankment which rested on running sand for a considerable depth. After considering several proposals, it was eventually decided to carry the sewer under the invert of an adjacent culvert which carried a brook through the canal embankment. The culvert was 8 ft. 9 in. high by 7 ft. 6 in. wide, of elliptical section, and formed of four half-brick rings. The sewer was formed of a hollow cast-iron invert block, which was substituted for the brick invert of the culvert. The preliminary stages of the work consisted of drilling holes through the invert of the culvert and injecting into the substrata very finely ground liquid lias lime grout through each of the holes by means of a grouting apparatus worked with compressed air at varying pressures up to 60 lb. per square inch, with the object of displacing the water present under the culvert and grouting the interstices of the sand, and so forming an artificial foundation which could afterwards be excavated to with safety. After the foundation had been allowed to set sufficiently long, the brick invert was cut out in short lengths and substituted by a cast-iron hollow invert block to form the sewage conduit made of a special section equal in area to a 24-in. circular pipe. The sections were 2 ft. in length, having a minimum thickness of 2 in. and a weight of about 12½ cwts.

In order to carry out this arrangement the brook was temporarily dammed at a point about 87 yds. above the upper end of the culvert, and the flow conducted along a trough over the land and by two troughs through the upper part of the culvert, so that the work could go on below. As each hole through

the invert was drilled, it was at once made good with wood driving plugs.

As the work proceeded, before removing the existing invert in any length, the interior of the culvert was carefully shored and stayed by strong centres, which were not removed until the consecutive castings were properly placed in position, and the brickwork at the sides made good and consolidated, the work being arranged so that not more than 2 ft. 6 in. of invert of the culvert was cut out at a time. As each length was cut out a few inches of grouted ground was removed from below it, and replaced by fine cement concrete. This was carefully formed by means of templates to the proper shape, and hammered down to its proper position.

The brickwork filling between the new invert and the old brickwork, being in the nature of underpinning, was grouted with cement mortar, 1 to 1, made very stiff and caulked with an iron tool. The V-shaped joints between the castings were similarly caulked, the connecting faces of each casting having been planed and fitted.

Although when the borings were made through the invert of the culvert a considerable pressure of water was present, when the old brickwork came to be taken out there was no difficulty experienced from subsoil water.

Cases of carrying sewers and outfalls over rivers were referred to. In these works cast-iron flanged pipes with faced joints ensured stronger work, and socketed pipes must not be used except when supported on girders. Reference was made to an overground line of pipes on piers, and the provision of expansion joints where considerable lengths are exposed to the effect of variations of temperature. Inverted syphons under streams or other obstructions were also dealt with, and the general necessity pointed out for their being laid in duplicate and provided with valves in manholes at each end, with sumps for cleaning out accumulated débris.

Mr. Platt said that, as a result of experience, he had in some cases provided a sump or débris chamber in the sewer approaching existing single-pipe syphons so as to intercept the accumulated débris, and thereby avoid the necessity of cleaning out the sump of the manhole at the end of the syphon.

The precautions to be taken in the preparations for crossing under railways were dealt with, especially the proper support of the running lines on long beams, and reference was made to the necessity of executing a brick sewer under the main lines in Rochdale a few years ago, under compressed air, through very treacherous strata at a depth of 50 ft. below the metals. Storm overflows were next mentioned, allusion afterwards being made to the present requirements of the Local Government Board of a weir over which no discharge shall take place into a stream until a predetermined degree of dilution has been reached of combined sewage and rainfall to continue to the disposal works.

[The canal crossing described by Mr. Platt is illustrated by a plan and section in the paper which Mr. T. de Courcy Meade, M.INST.C.E., the city surveyor of Manchester, read at a meeting of the Institution of Municipal and County Engineers held at Manchester, and reported in THE SURVEYOR of February 27, 1914.]

DISCUSSION.

Mr. J. A. SETTLE, borough engineer and surveyor, Bury, said that concrete tubes were very useful in some cases, but they required to consider very carefully if brick sewers were not more useful. For all large sewers he preferred to use bricks, as in Manchester. He did not think concrete would stand the action of chemicals as well as brickwork. They could not make such good joints with either the ogee or rebated joint of the concrete tube as with the earthenware or stoneware pipe. He thought the concrete pipes built up in segments ought to be surrounded by concrete. One could not test concrete pipes as one could test Accrington bricks. He would like to ask Mr. Platt how much rainfall he provided for in Rochdale. He should also like to know if they had any trouble from roots of trees getting into their sewers, as he had an area of 30 acres which was drained by rubble drains, and they got filled with roots of trees, although laid at a depth of 12 ft.

Mr. C. H. COOPER, borough engineer, Wimbledon, said they found tree roots 23 ft. deep in the London clay; he thought the trees were black poplars. Concrete was all very well where one had a sewer which was not movable; but in the London clay one had failures, especially on hills. Pipes frequently got smashed to bits, and yet carried sewage for years, and then they would go all at once. The amount of rainfall to be provided for in the sewers depended upon many things, but a fairly reasonable allowance was 25 cub. ft. per acre per minute on built-up ground. Referring to the manhole covers shown on the slides, he said he did not know of a good manhole cover. They were generally of cast iron, 5 in. deep, and if one got a heavy wheel on one side they either tippled or broke. Airlocks put an engineer in a far safer position for underground work. So much successful tunnelling had been done in recent years by pneumatic shields that it was now a difficult matter for anyone to claim compensation for his house being damaged by excavating. He did not think it was necessary to go in for the heavy (Accrington) engineering bricks mentioned by Mr. Platt. They got in London good stock and gault bricks quite suitable for this purpose, and very much cheaper.

Mr. A. J. PRICE, engineer and surveyor, Lytham, said he thought the trouble with roots of trees in sewers at a depth of 12 ft. to 23 ft. was due to the roots getting into branch drains with defective joints, and travelling down to the main sewers, though many old shallow sewers with clay joints were troubled with roots. He had frequently found branch drains filled solidly with roots for many yards in length. He thought for sewers above 2 ft. in diameter the concrete pipe was better than earthenware or stoneware pipes. Earthenware or stoneware pipes of this size could not be burnt without warping, and it was difficult to manufacture these pipes with a truly cylindrical shape, while the concrete pipe could be moulded to a proper circular form. The concrete pipe with either an ogee or a rebated joint had a much truer alignment, and if laid on a concrete foundation or encased in concrete, as all his sewers were, they made much more satisfactory work than the vitrified-ware pipes. They were easier to handle, quite as cheap and as strong and non-absorbent as the glazed pipes. With regard to the effect of chemicals on concrete sewers, he did not think there was any great reason for the fears of those engineers who preferred brick or vitrified-ware sewers on these grounds, as they quite overlooked the fact that in both these sewers they had to rely on cement for joints, and if chemicals were bad for concrete they were equally bad for cement joints. There was much greater danger from chemicals in the case of bituminous jointed pipes. At Widnes some years ago Mr. Sinclair, the borough engineer, called attention to the destructive effect of the chemical wastes in the sewers jointed with bituminous materials, and the pitch and sulphur of which so many patent joints were made were, in the speaker's opinion, much more likely to be badly affected by chemical action than cement joints. Where ramps were necessary for sewering steep streets he preferred an easy inclined fall rather than the vertical drop into a trap, as adopted at Rochdale. All traps in sewers were bad, and especially one with a high vertical drop in which the solid matter, falling from such a height, was liable to block the trap. He did not think the iron flap on the short rodding arm of the sewer was much use, as in his experience he had generally found them kept open by paper or solid matter which prevented them acting properly. It was now generally admitted that sewer air followed the flow of the sewage, and he was of opinion that all that was necessary in the way of ventilation and to avoid the danger of air travelling up the sewer was to fix tall ventilating shafts at the manholes where ramps were required, and dispense with the traps and flap valves, which were either useless or liable to create a nuisance.

Prof. RADCLIFFE said the materials of which sewers were made were of great importance. He had carried out a great number of experiments in the technical school with various materials, both as regards their strength and composition. He hoped at some future time to lay the results of these before the members of the institute.

The CHAIRMAN (Sir Henry Tanner) said he should like to refer to the use of concrete pipes, for the reinforced-concrete pipe was, in his opinion, a very superior thing altogether. Those made outside Paris (the Bonna pipe) seemed to be extremely good, and had proved very satisfactory at Swansea.

Mr. PLATT, replying to Mr. Settle, said the amount of rainfall to be provided for in the sewers largely depended upon the nature of the ground and the extent of the paved area. Referring to the methods adopted at Rochdale on sewers for steep streets, he said he had had no trouble with the flaps, which

only following the example of that fine sanitary engineer, Sir B. Rawlinson. The Barrow system of [illegible] papers was read at Norwich [illegible] most interesting paper on this subject was read before the Concrete Institute by Mr. J. Tingle. He agreed [illegible]

ECONOMY IN REINFORCED CONSTRUCTION.*

By [illegible]

[illegible] concrete for the external walls of buildings, as brick walls up to a thickness of 14 in. are cheaper; but when walls have to be thicker than this reinforced concrete comes in. As, under the proposed London County Council regulations, nearly all external walls need not exceed 14 in. in a framed building, it is probable that reinforced-concrete walls for this purpose will soon cease to be used from the point of view of economy.

With regard to the economy of reinforced-concrete [illegible] the London area the economy is very considerable; inside the London area the London County Council, by their regulations, [illegible] framed building even in London.

THE TIME FACTOR.

[illegible] tion of building operations of all kinds, and that is time, and I mention it in this connection because many people are of opinion that the quickest form of construction is steel construction, and if drawings [illegible] the steel framework has been fabricated beforehand and is ready for delivery the moment it is required, it may be that the steel frame is the quicker. But this is not always so, and starting from the same point—that is, the time when working drawings of both reinforced-concrete frame and steel frame are ready, generally some time after the foundations of the building have been started—it is possible, in ordinary times, to obtain steel bars in fourteen days from that date. But it generally takes six weeks to obtain built-up stanchions; so that at the beginning reinforced concrete gets a four-weeks' start.

Again, in steel-framed buildings many architects use coke-breeze concrete or broken-brick concrete between the R.S.J. fillers. Neither of these is watertight. Reinforced concrete 4:2:1 is practically so, and in a building constructed some years ago, seven stories high, I remember the plaster-work was started on the ceilings of floors below the fourth before the seventh floor was finished, and as each of the remaining floors took about a fortnight to do, another month or six weeks was gained on the steel-framed building, as asphalt on the roof would have been necessary to prevent rain coming through the breeze or broken-brick floors and spoiling the plaster.

It seems hardly necessary to mention that, in the construction of bridges, say, up to 300-ft. span at least, reinforced concrete is nearly always the most suitable material. There are, of course, exceptions, but the mere question of the cost of maintenance of a steel bridge seems to me enough to condemn it.

The question of maintenance is also enough to decide an architect or engineer to choose reinforced concrete for the construction of, say, small water towers, coal bunkers, gasometer tanks, or any similar structure heretofore built in steel, and exposed to atmospheric conditions, even if reinforced concrete is not cheaper in the first instance.

With regard to timber structures the same applies, and, in addition, the relatively greater resistance to destruction by fire makes the advantages of reinforced concrete so apparent that one wonders why timber is employed in the construction of what was at all.

WASTEFUL PROCEDURE.

But, to turn to the other side [illegible] may in which, in these strenuous days of competition, seems [illegible] enormous amount of waste which occurs through one of the methods adopted by architects to obtain cheap prices for the carrying out of work. An architect prepares the general design of a building, and sends sun-prints to four, five, or even six different firms of specialist designers, who in turn prepare each their reinforced-concrete scheme, and send out to five or six or even more contractors for prices, involving a total of some thirty to forty persons, all of whom spend money and time in tendering. Much valuable time is also wasted which might otherwise be spent in the construction of the building, while the various prices and schemes are being compared and adjudicated on. This puts an initial charge on reinforced concrete which might be avoided if the architect or engineer would only choose his system, or employ a consulting [illegible] forced-concrete work, and then send out for prices in the usual way.

One difficulty with centering is the amount of props required. If this is left to the foreman in charge of the work it is very likely that the number put in is either too many or too few, and I would suggest to contractors, what has often been suggested before, that great economies might be effected by employing a competent man to design the formwork.

Another point which makes for economy in reinforced concrete, but has more to do with design, is [illegible] to handle a 12-in. diameter bar 25 ft. long as it is to handle one that is only 1-in. diameter, as the weight is immaterial. Again, in this connection I would point out that the 12-in. diameter bars occupy less space in the width of a beam than the 1-in. diameter bars, and the labour cost on concrete may be reduced by 30 to 50 per cent by the employment of the larger diameter bar. Again, with fewer bars there are fewer ends, and, in many cases, stirrups or shear members to fix, and the smith's work is correspond- [illegible]

* Abstract of paper read at the last meeting of the Concrete Institute.

PUBLIC OFFICIALS ON MILITARY SERVICE.

A REDUCED ALLOWANCE.

[illegible] dent of the Local Government Board was asked—(1) The amount of salary paid to the inspector of nuisances in the rural district of Swaffham, Norfolk, prior to his joining His Majesty's Forces; the present amount of his allowance from the rural district council; and the present amount paid to the temporary inspector of nuisances; and (2) whether the Rural District Council of Swaffham, Norfolk, in August last granted their inspector of nuisances leave of absence for military duties during the continuance of the present war, and agreed to pay him half-salary during that period; whether on December 31st last that agreement was broken and the amount reduced by one-half; if so, whether the consent of the Local Government Board was specifically given to the reduction; and the grounds on which such consent was given.

In reply, Mr. Herbert Samuel said the inspector of nuisances to the Swaffham Rural District Council was appointed in 1913 at a salary of £100 per annum. He was a trooper in the King's Own Norfolk Yeomanry at the outbreak of the war, and as such was called out for service. The council resolved to reinstate him on his return, and to pay him a salary of £50 per annum during the continuance of the war. They appointed a temporary substitute at £50 per annum, and the board sanctioned these arrangements. In December the temporary substitute tendered his resignation, and the council induced him to withdraw it by increasing his salary to £75 per annum. At the same time they rescinded their resolution to pay the inspector £50 per annum during the continuance of the war, and passed another resolution to pay him £25 per annum during this period. The board refused to sanction this reduction unless the inspector consented to it, but on being informed that the inspector had been told of it and had made no objection, they gave their sanction. The inspector had now informed him (Mr. Samuel) that he had notified the council that he objects to the reduction, and the board were asking the council to reconsider the matter.

Economics of Town Planning in Relation to Land Development.*

By G. L. PEPLER, F.S.I., Town Planning Department, Local Government Board.

Perhaps I ought to preface my remarks by referring to the permanent Civil Service appointment that I have recently received, and to mention that this paper was in the shaping while I was still in private practice, and therefore I have not suppressed it, although, of course, the views expressed have nothing to do with my present official position.

The title of this paper was suggested to me. . . . Now I have come to set my ideas down it is borne upon me that I cannot possibly write up to such an ambitious heading. All I can attempt is to set out a few of the economic problems that I have met with in practice, with a view to initiating a discussion into this important side of the question: I refer to town planning in general as it may affect property owners, and do not restrict my observations to operations under the Act.

Why should landowners develop their land on town planning lines? Many of them have in the past cut up their estates profitably on the old lines, and what advantage can accrue to them by changing their methods? I do not wish for a moment to suggest that landowners as a class think only of their own interests, because experience has convinced me that this is very far from the case. The point I wish to make is that unless town planning is economically sound all its other virtues are of little practical use.

Our object this evening is not to discuss the rights and wrongs of the present property laws, but, taking things as they are, to consider whether town planning is financially sound as regards land development. In my opinion it is, and for the following general reasons:

I think it is true that more money has been made in the past out of land by the old methods than is being made now, even in cases where methods that we should approve have been adopted. This does not prove that our methods are unsound, but rather that past carelessness has queered the pitch.

To realise the present position it is necessary to look back a little. Up to about the middle of last century England was principally an agricultural country, and the growth of towns was comparatively slow. Buying a plot and building a house was a leisurely matter, as we can gather from the old estate and deed plans with their elaborate north points and headings, which must have taken hours to do, and were apparently considered of more importance than any attempt at accuracy in the plan. This was the kind of land-dealing machinery in operation when the great industrial revival came along and people flocked to the towns, which consequently grew at an amazing pace. Industrialism was the one thing in all men's thoughts—where and how the workers were to live was largely a side issue. Consequently hardly anybody looked ahead, and landowners with the rest mostly just sold off their land as demanded, often without restriction and without any thought as to the possible effect on the rest of their estates.

LACK OF FORESIGHT.

While the demand was insistent things went well for the landowner, but the day of reckoning was to come. In many cases over-speculation had been indulged in by the developing middlemen, which resulted sometimes in derelict estates, and in other cases the speculator, having bought without restriction, and only being interested in clearing off the block of land he had bought, altered his own restrictions halfway and sold off the balance for another purpose to the injury of both his original purchasers and of the large landowner from whom he had bought the block. One could give many instances of large estates that are now at a standstill because development was allowed to commence in this way without any general plan or conception, the result being that the attractions and amenities of the whole estate have been damaged. Not only has this lack of foresight spoilt the market for the rest of the estate, but frequently one finds extra cost entailed in roads and sewers because each block has been treated by its purchaser in the cheapest possible manner for his own ends alone, and consequently when adjoining land comes to be developed there is no general scheme to fit into, and money has to be spent that might have been saved, and efficiency has to be sacrificed. One has even met frequent cases where an owner has sold off frontage land that actually blocked him from proper access to develop back land.

There is no need to labour the point, as in these days the necessity of a comprehensive scheme in estate development is generally recognised, and that such a general scheme should include the settling of such matters as the position of the principal roads, the depth and gradient and position of sewers, the class of property suitable for each part, and the rotation in which the land should be developed, taking into account the effect on existing farm tenants. . . .

FINANCIAL CONSIDERATIONS.

Without question the more perfectly and the greater the foresight with which an estate is developed from the commencement, the greater will be the ultimate value, as all that is accomplished, if well done, should enhance the future value. Many owners realise this, but then comes in the question of immediate finance. They are quite willing to have a scheme prepared, but they lack the means to carry it out. In this respect it is well for any town planner called in to advise to bear in mind that in framing his scheme the first thing he has to consider is the financial resources of his client; and, secondly, the type of demand for which the estate has to cater. It is futile to put on paper a grandiose scheme, including great boulevards, "places" for grand public buildings, and roads set far apart, when your client cannot possibly afford to carry out the conception, and the demand is for cottages for which a depth of 150 ft. is ample. Another difficulty is that plans by themselves are not convincing, as very few people can read plans; what is essential is some actual examples both of buildings and types of roads, &c. The difficulty is to provide these examples. Probably arrangements can be made for the roads and sewers, but as regards buildings there is much greater difficulty, and this difficulty is particularly patent in the case of settled estates, or where the ownership is otherwise restricted and plots can only be leased, or, if sold, the proceeds cannot be used for erecting buildings. . . .

The speculative builder is a much maligned person, but one should bear in mind that he is the man who, up to now, has almost entirely met the housing demand, and as he is usually a pretty shrewd person, one can be sure that, on the whole, he has been giving the public what it wants. Therefore one should study carefully his achievements, and, rather than destroy, see how they can be adapted to more artistic results without increasing the cost appreciably. A great deal can be achieved in this way, and by degrees one can hope to arrive at a house that not only satisfies the artistic eye, but also "fits" the ordinary man, who has got used to one style and fears discomfort from too sudden a change.

OPEN SPACES.

It is not only as regards buildings that financial difficulties arise; there is also the question of open spaces. One may show them on paper, but who is to make them, and how are they to be maintained?

If a fairly large block of land is being sold or leased to a tenant society there should be no difficulty, as such an organisation can raise funds for laying out and maintaining an open space; but in cases where plots are being disposed of separately, it is more difficult to obtain concerted action. The general feeling seems to be that such things should be thrown in by the owner, and that he should bear all costs of construction and maintenance, and at the same time should charge no more for his land. Such a view, to my mind, is quite unwarrantable, but it has to be reckoned with. Where the demand for land is great it is an easy matter to put an annual charge on each plot, but where one is coaxing purchasers they cannot be dealt. In some cases the simplest and best solution may be to hand over the open space to the local authority, if they will take it; but this means that it will be thrown open to all, whereas, if larger houses will surround it, most residents would prefer

*From a paper read at a meeting of the Town Planning Institute held at Westminster last Friday.

more limited use. Usually, I think, the best method is for the owner to lay out the open space if he has the funds, and then either charge for admission to the whole by letting out keys to residents, or reserve part for tennis courts, &c., which can be let to clubs at a total rent sufficient to cover the cost of outlay, interest and general upkeep.

RESTRICTIONS.

Another problem that has a financial bearing is that of estate restrictions. . . .

As to what one should insist on, I think that in the past too much emphasis has been laid on a mere money restriction. It is probably necessary to insist on certain minima, but the design and character of a house are far more important; indeed, who would not far rather see a small house on a big plot than a big house on a small plot? and, within reason, most would prefer it for a neighbour.

The most important restriction, perhaps, is as to the use that the property may be put to, and next that the design should be approved by a superintending architect. This means a good deal of trouble to the superintending architect, and trouble for which the purchaser cannot be expected to pay in full, but which it is well worth the while of the landowner to recompense. The architect in charge should let the purchaser know at the earliest possible moment the type of design that is suitable, so as to prevent a false start.

Also, I suggest that it is well to state in the sale conditions what materials are barred for outside work—such as naked Fletton bricks and blue slates, in most cases—and this is particularly necessary where you are trying to pull together an estate that has been started on careless lines. The minimum pitch of roof should also be stated; in fact, failing examples, the more clearly you indicate the type of house you desire the less likelihood there will be of misunderstanding and unnecessary trouble. Again, the type of fence, wall or hedge needs carefully settling, as nothing looks worse than an incongruous mixture; one has to remember in regard to this that everyone is entitled to have at least a dog-proof boundary. . . .

CONCLUSION.

Practically all classes of development have had to conform to by-laws that were general in application, and could not be varied to meet particular cases. In the past, no main traffic routes having been provided, trams and 'buses have often been brought along insufficiently wide and ill-adapted streets to the consequent deterioration of all the residential property fronting thereon on account of the noise, dust and danger. There are often rights of way across land that make it extremely awkward to use the latter for building purposes. To divert any of these has been a long and comparatively expensive business, each having to be the matter of a separate application, and, under the general law, only permissible under certain conditions which cannot always be fulfilled, and which it is not always desirable to fulfil.

Quite frequently estate boundaries are not at all convenient when building development is desired, and lead to waste in the plotting and road making. The alternative was for the owner who first wished to develop to make some arrangement with his neighbours, and this was often a difficult matter.

These particular difficulties of estate development all meant expense to the owner and tended to lack of efficiency. A town planning scheme gives the opportunity for all these disadvantages to be cleared away, and it can provide settled conditions which are a great attraction to purchasers. By-laws can be adapted to express local requirements, and thereby expense is saved and frequently extra beauty obtained. The position of future open spaces will probably be settled, so that the owner will have definite attractions to offer. Estates can be developed to take advantage of routes intended for main traffic instead of, as previously, there being no certainty as to the routes main traffic would follow. Probably by giving up land where properly required for main routes, owners will be permitted to make narrow residential roads, and thus save expense in development. All rights of way can be dealt with together in consideration of the general plan, and without the Highway Act restrictions. One could enlarge the point, but perhaps I have said sufficient to make clear that the Town Planning Act, if properly understood and taken advantage of, should prove of real financial benefit in estate development.

DISCUSSION.

At the meeting of the Town Planning Institute at which the foregoing paper was read, a discussion was opened by

Mr. E. WILLIS, engineer and surveyor to the Chiswick Urban District Council, who proposed a vote of thanks to the author. There were, said Mr. Willis, a great many points of interest in the paper, and he thought the title gave them food for discussion. The remarks he was about to make were, of course, without prejudice, for probably he would not be voicing the feelings of his council; but he had been engaged with a great many estates, both in private practice and, since then, in connection with his present work, and there were numerous cases of small properties, covering practically thousands of acres, where town planning was bound not to be economical from the owner's point of view. If one gave a cottage an unnecessary amount of garden there was certain to be a loss to the owner. Where the tenant made a hobby of gardening it was an advantage to give a large amount of garden to a cottage, or, say, an ordinary villa. Although he personally had a small garden, he was sorry to say that it had usually looked rather derelict, unless he had employed someone to attend to it, and he thought most suburban residents were satisfied with a small garden. In town planning they might be well advised, in laying out squares, or such like, especially in connection with small property, to lay out in such a manner that there was provided a garden that could be utilised by the various residents in the form of allotments, but with restrictive powers, so that those who took an interest in gardening would have what was practically an allotment in the ordinary sense of the word, though more for the purposes of their hobby than for anything else. Then, as regarded roads, the cost of these was, of course, very great when they put a large number of houses on a small area, and was a very greatly increasing item. Formerly, however, it was not so great, and that was why the old property owners made a great deal out of their estates. He was a great believer in town planning, and would still advocate it for urban areas throughout the country; on the other hand, he would advocate subsidising it, for if they were going to treat the landowner fairly they must subsidise him if they intended to cut his property about, particularly if it affected his pocket; and he thought the time would come when local authorities would have to subsidise town planning—though he said it without prejudice. They must not expect to get everything from the landowner. He would benefit if he developed on large lines, but the man who developed on small lines was not so likely to benefit by a town planning scheme. He thought that what they had really got to aim at was to educate the owner up to public spiritedness. That brought them to the question of open spaces. Local authorities did not always want an open space before an estate was developed, and they could not afford—especially the smaller bodies—to lay out an open space in the way that probably it should be laid out to draw the people to a district, and yet it was needed very often to attract people and develop the land. He considered it would be quite possible for a clause to be inserted in a town planning scheme partially to subsidise these open spaces, so as to start them, and thus gradually draw the people to an estate and expedite the development. That was a very strong point in a paper—the question of speeding up development—and anything tending to that was going to benefit the district and the landowner, two points which should be considered together.

Mr. C. J. JENKIN, engineer and surveyor to the Finchley Urban District Council, observed that Mr. Pepler's paper was most interesting, and of the type that led to beneficial discussion without being dogmatic. The author had said that the Town Planning Act was not thoroughly understood. That struck at the root of the economic difficulty of town planning. One could not get people to appreciate that good development would in every case be to their benefit, and if that could be instilled into the minds of owners—especially small owners—it would be a good thing attained. The Town Planning Act was for the future, and in the matter of gardens they were hoping that town planning would inculcate a love of the garden, in addition to other things. An owner could not always recognise that the assets of lands were not the immediate turnover, but the health of the country. He could not see that it was to his advantage to develop on good lines. Land was sold to a

building owner, and he wanted to get rid of that land as soon as possible. He developed it very badly, and that was one of the great difficulties. With reference to land about cottages, that was one of the difficulties met with in designing, and he agreed that the allotment would be more attractive than the garden to the cottager. There were owners and owners—some enlightened and some not. All owners were not rich, and had not the means to develop their land, and there ought, he thought, to be an arrangement by which authorities could obtain a loan from the Local Government Board and advance money to these owners, under restrictions. His own council had acted on that idea in many ways, especially in the matter of drainage—a subject in regard to which he considered they heard too little at the meetings of the Town Planning Institute. A man said, "I cannot afford to lay sewers." The council were under no obligation to lay sewers until the houses were erected and ready for drainage. His authority therefore tells the owner they will construct the sewers for him if he will pay the council capital and interest until such time as the sanitary rate on the houses to be erected wipes out the sinking fund, and the amount the owner had to pay decreased with each house that was erected on the site. He did not think the owner wanted any advance on open spaces. With the good owner there was little difficulty. He would have his houses well designed, but as a municipal engineer one saw only too frequently cases in which builders got a plan of a house from an architect, and the office body took tracings from it *ad nauseam*. That was helpless in getting amenity and a home which people could enjoy. Some of those points represented difficulties in dealing with small ownerships. If they could only insist that every house should be designed by an architect that difficulty would be removed.

SHELLFISH FROM SEWAGE POLLUTED WATERS.

NEW LOCAL GOVERNMENT BOARD REGULATIONS.

The Local Government Board have issued to port sanitary authorities, metropolitan borough councils and councils of boroughs, and urban and rural districts copies of an Order [No. 57,553] containing regulations prohibiting the sale of shellfish likely to cause danger to public health.

Numerous representations, it is stated in a covering letter, have been made by local authorities to the board to the effect that further powers are required to prevent danger to health from the consumption of shellfish which have been grown or fattened in polluted waters, and these were submitted to the Royal Commission on Sewage Disposal. The Commissioners stated in their fourth report that they were satisfied, after carefully considering the whole of the evidence on the point, that a considerable number of cases of enteric fever and of other illness were caused by the consumption of shellfish which had been exposed to sewage contamination, and they made certain recommendations for preventing the sale of polluted shellfish for human consumption.

Opportunity has not yet arisen for altering the law in the way recommended by the commission, and the present Order has been made with a view to the provision of an alternative procedure under powers which the board already possess. In framing the regulations the board have taken the opportunity of consulting the Fishmongers' Company, and several suggestions made by the company have been incorporated in the Order.

Machinery is provided by the regulations for the closing of shellfish layings in regard to which there is evidence to show that shellfish from such layings have actually caused infectious or other disease, or are likely to be a source of danger to public health. The power to close layings is vested by the Order in the sanitary authority of the district in which the layings are situated, and a right of appeal to the board is provided for in the particular cases specified in Articles VI. and XI. of the Regulations.

The sanitary authority of the district in which the layings are situated are required to take action on receipt of a representation from another local authority, in whose district the shellfish are consumed, indicating that the shellfish have caused or are likely to cause, infectious or other disease, or, on the report of their own medical officer of health if such shellfish are found in their own district.

Apart from any representation from another district, the medical officer of health of every district in which shellfish are laid is asked to examine the conditions of the layings in his district and report to the local authority any cases in which the layings are so situated as to be liable to dangerous contamination, with a view to steps being taken under the Regulations to prevent shellfish being distributed for sale for human consumption from such layings unless the shellfish have been relaid in fresh water for a period sufficient to free them from contamination. The board are advised that, as a general rule, the period of relaying required to rid shellfish of micro-organisms should not be less than a fortnight.

In this connection the board consider it of great importance that any action taken with a view to the closing of a laying should be based rather on epidemiological and topographical considerations than on the results of bacteriological analysis. On this point they refer to the findings of the Commissioners on Sewage Disposal, who in paragraph 64 of their fourth report state that in their opinion they would not be justified in recommending "that the closing of a foreshore, laying or pond should depend, as a matter of routine, on the results of a bacteriological examination." They also direct attention to the following extract from that report:—

> "65. It will be seen from the evidence of Dr. Bulstrode and others that in the great majority of the cases in which outbreaks of disease have been clearly traced to shellfish, the foreshores, layings or ponds from which the shellfish have been procured have been so situated that the opportunities of pollution by sewage have been obvious and indisputable. That is to say, the foreshores, layings or ponds in question were such as would have been condemned on a careful examination by a trained person without the aid of bacteriological examination of the water or the shellfish. Having regard to the number of such foreshores, layings and ponds obviously liable to pollution which Dr. Bulstrode has noted in England and Wales, and Dr. Browne in Ireland, we think that in the light of experience we are justified in concluding that, if those were closed, or else freed from chance of pollution, the greater number of cases of disease due to the consumption of contaminated shellfish would be eliminated."

The Regulations will take effect from Monday next, March 1st. The board are anxious to secure uniformity in the administration of the Regulations, and will be glad to have their attention drawn to any cases of difficulty which may arise.

ROAD BOARD GRANTS.

COUNTY COUNCILS ASSOCIATION'S ACTION.

On Tuesday, at the annual meeting of the Council Association, held at Westminster Guildhall, Lord St. Aldwyn, referring to the subject of Road Board grants, said it was hoped that they would be able to persuade the board to continue to make grants for surfacing work, and that they would be able to induce the Local Government Board to get rid of the fear that the money might be needed for the relief of unemployment—a contingency which, in his opinion, would not arise during the period of the war. His lordship mentioned that he knew of several county councils who had incurred capital expenditure on the strength of getting grants from the Road Board, and if the board did not fulfil its obligations it would be bad for everybody.

At a meeting of the Executive Council of the association, held on the following day, a proposal that the Treasury should be urged to consent to the Road Board continuing its annual grants towards road reconstruction and road crust improvement in the counties, and that the Chancellor of the Exchequer should be asked to receive a deputation on the subject, was agreed to.

Volunteer Women Tramway Conductors.—Ladies of independent means are said to have offered to act as conductors on Edinburgh tramcars, and to hand their wages to [illegible] dependants of soldiers. At Newcastle the tramway manager's hint that women may be employed has brought a very strong protest from the present employees.

INSTITUTION OF MUNICIPAL ENGINEERS.

NORTHERN DIVISION ANNUAL DINNER.

The annual dinner of the No. 1 (Northern) Division of the Institution of Municipal Engineers was held in the Royal Turks Head Hotel, Newcastle-on-Tyne, on Saturday, the 14th inst., Mr. William Pearce, county surveyor of Cumberland, chairman of the Northern Division, presided, and amongst the company of sixty was the Sheriff of Newcastle.

The loyal toasts were [illegible]. Replying to that of "The Navy, Army and Allied Forces," Captain Tatton observed that he [illegible] work as a Royal Engineer in the Volunteer Corps, he had been brought into touch with a very large number of the local authorities. When they had required work to be done by the [illegible] frequently been the case, it had nearly always to be done in a great hurry. The assistance and help he had received from the authorities and their engineers had been most willing and most generously given, and he hoped that [illegible] of municipal engineers and surveyors would not be forgotten.

"The Local Government Board, Road Board, and Administrative Bodies" was proposed by the CHAIRMAN. The Local Government Board, as they were all aware, was formed for the purpose of governing schemes and expenditure of local authorities, and, as public engineers, they looked to the Local Government Board rules as their chief guide in the carrying out of their various duties. His own opinion was that by giving the ratepayers an opportunity of attending public inquiries to lodge their objections to any particular scheme, the engineer responsible for the scheme could go on with greater confidence after the approval of the board had been given. [illegible] Government Board [illegible] engineers in carrying out large and important schemes. Also the granting of a portion of the salaries of certain officials to local authorities very often enabled councils to offer better salaries to properly trained officials. There was one thing which had not yet been done, and which, in his opinion, rested with the Local Government Board—that was, to support a Bill in Parliament to grant to all public officials superannuation and security of tenure. This matter, he felt sure, would very soon occupy the attention of the Local Government Board, and he sincerely hoped that their request in this respect would have the full approval of the board and that they, as local government officials, would enjoy the same benefits as civil servants and Poor-law officers. With regard to the Road Board, he felt sure that all road engineers who had taken advantage of the purse of that authority must admit that they had been able to do much more surfacing work than they could have hoped to do without its assistance. He had heard it said that the Road Board existed only for the benefit of county councils, and that rural district councils derived no benefit whatever from the board. In the meantime this might, to some extent, be true, because it is natural that the Government were desirous that all main trunk roads carrying heavy through traffic should be strengthened and put into good repair [illegible] consideration would be given to other roads where the traffic was not so excessive. There was no doubt in his mind that the board since its formation had made rapid strides in the right direction, and that its future policy would meet with general approval. As to the administrative bodies, it was to these that they, as officials, had to look for their bread and butter, so they might say that the administrative bodies were first and foremost in their minds. A council of any kind could not, in his opinion, be too careful in the appointment of its various officials, and full consideration should be given to the amount of salary to be paid to these officials. A man who was worthy of his position under a council was worthy of adequate remuneration. The great mistake that was often made by smaller authorities was in offering too small a salary to secure the services of a properly qualified [illegible] official, as a good and properly trained official could very often save his council considerably more than the equivalent of his salary each year. The comfort of the public depended upon engineers to councils. They required to have the very best roads and footpaths, and, in water schemes, water of the very best quality; and then there were sewage matters, lighting, and other things which all required the careful attention of the engineer. The comfort of the official chiefly depended upon [illegible] council, and in these days when officials were expected to cope with all kinds of local government regulations and new works they should have the full support and appreciation of their councils.

Mr. Alderman DIXON (vice-chairman of the Cumberland County Council), in replying to the toast, remarked that the bulk of the members of councils seemed to go to their meetings with the chief idea of keeping down the rates as low as ever they possibly could, to do as little work as possible, and to pay the surveyor as small a salary as they possibly could; but he was pleased to say that in the future, in his opinion, a better spirit of affairs would obtain. If councils wanted properly trained officials they should pay a reasonable salary.

"The Institution of Municipal Engineers" was proposed by Mr. T. M. CARLISLE. One [illegible] of the institution—a very valuable institution indeed—was to make themselves more accountable to the public, and to show that the services that they had rendered had been given in the best spirit, and a spirit which required necessary compensation. By meeting together and holding discussions they were [illegible] themselves good, but [illegible] the councils they served. The institution was only a young one, but he thought it was a very happy augury for them that they could muster something like 1,000 members, and he was sure that if everybody was imbued with the same spirit as the president (Mr. Matthew Jones), the success of the institution was assured. He coupled with the toast the names of the president and Mr. C. W. Hall, of Felling.

The PRESIDENT, in responding, observed that public bodies owed a great deal to their officials. It had always been his endeavour when at home never to take on more work for his council than he could accomplish, and he believed that if surveyors and engineers generally speaking would do just what they could, and when their councils said "We want another little job doing," were straight with them, and told them that their time was already fully occupied, it would stop all this extra work being put on surveyors for the same salary as when they were appointed. It appeared that the majority of councils endeavoured to get as much out of the engineers as they possibly could without granting extra remuneration. He did think that it was for the institution members to stick together, and to say, "We are going to do what we can, and we are going to do it well." If they took on too much work they could not do it satisfactorily either to their councils or themselves. Their institution was not yet, as Mr. Carlisle had said, in its teens. They were only seven years old, and had 960 members. He hoped that when they had reached their majority they would be as influential a body of municipal engineers as there was in the country, and he thought the way they were going on pointed to every success. Great credit was due to the members of the No. 1 (Northern) Division for the way they attended their district meetings and carried on their business, and it was a great pleasure for him to be there that night. In the Southern District it was difficult to muster a sufficient number of members to hold meetings at all. As president this year he was going to attend one meeting in every division, and he hoped that at the end of his term of office the membership would be greatly increased.

"The City and County of Newcastle-upon-Tyne" was proposed by Mr. J. JARDINE, town clerk, Morpeth, the SHERIFF OF NEWCASTLE responding. "Our Guests and Visitors" was proposed by Mr. J. H. HALSTEAD, surveyor, Knaresbrough Rural District Council, Mr. RICHARD AMES (London) replying.

Special Fire Survey Force.—Owing to several members having obtained commissions in the Army, there are now some vacancies for architects, civil engineers, building surveyors, and insurance surveyors who are prepared to act in a honorary capacity on the Special Fire Survey Force, whose headquarters are 8 Waterloo-place, London, S.W. Professional men are required to give on the average one day per fortnight (generally Saturdays). They should be men of experience, perferably over thirty-five years of age, and the districts in which further assistance is specially required are: Cornwall, Durham, Gloucestershire, Somersetshire, Warwickshire, Wiltshire and Worcestershire.

Bituminous Road Construction.

DRYING AND MIXING MACHINERY.

At the present time there is a great deal of matter published in general and in technical papers putting forward elaborate statistics and comparisons relating to the trade of this country as compared with its allies, its enemies, and the various neutral countries.

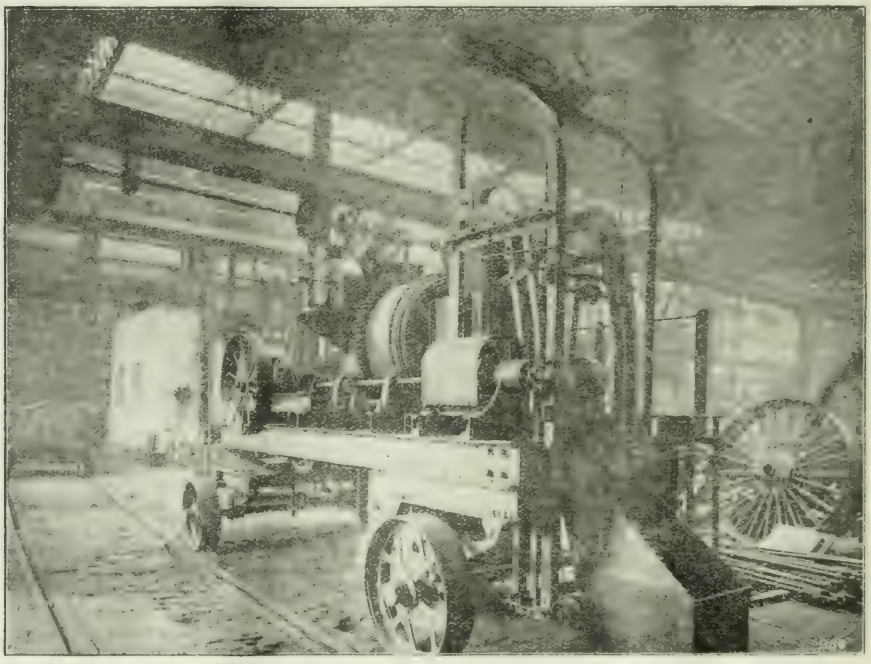
In many cases these comparisons give proof that this country is not so far advanced in its development and application of science to industry as is the case in other countries. There is one particular sphere of industry, however, in which it may be said, we think without contradiction, that the British Empire is second to no other country in the world. We refer to the science or industry of road making.

Historical works show that almost from time immemorial the question of roads, their construction and maintenance, has been a matter of material interest, experimental investigation, and practical test. While the construction of roads in the bygone ages, from an historical point of view, is well worth study, it unfortunately does not offer any great encyclopædia of information as to what are the most practical lines upon which present-day road construction should be carried out. The conditions under which roads need to be constructed and maintained at the present time are so entirely different from the conditions which prevailed even fifty years ago that engineers are still investigating and experimenting with a view to obtaining roads which are capable of performing their requisite duties.

The introduction of mechanically propelled vehicles moving with comparatively high velocity, and carrying what our forefathers would consider to be abnormal loads, has created what might be termed a "road revolution," with all the consequent alarms, necessitating the introduction of entirely new means of preserving highways from rapid and total destruction. Roads which under ordinary horse traffic have been looked upon as of solid and sound construction, presenting a comparatively smooth and uniform surface, have, under the influence of mechanical vehicles, become with great rapidity a mass of holes and ruts combined with either an abnormal and dangerous quantity of mud, or, in the dry weather, an objectionable amount of dust.

This rapid deterioration of the roads under modern traffic, however, soon established the fact that the old method of binding the road crust by means of water was no longer an economical and satisfactory procedure on highways used by any considerable quantity of heavy and fast-moving vehicles. Many forms of road construction have been introduced to supersede the old water-bound macadam road, but their introduction, while from the usage point of view perfectly successful, has been limited owing to the almost alarming increase in the cost of the road when so prepared, the result being that it is only in large towns and cities that it has been in any way possible to contemplate their use.

Mechanically propelled vehicles have, whether used for pleasure or industry, a very large radius of action



RANSOME COMBINED DRYING AND MIXING PLANT (FIG. 1).

from their home stores, and it has therefore become in many cases absolutely essential to treat not only the roads within large towns and cities in some improved way, but also the main trunk roads connecting such towns and cities.

We think we are justified in saying that of all the modern means of road construction the one which has been most extensively adopted is that in which tar or bitumen is used as a binder for the material forming the road surface. At the present time there are in existence roads constructed in an almost infinite variety of ways, all having as their basis some combination of stone, slag or sand, with tar or bitumen.

The construction of such roads has automatically created the necessity for machinery capable of producing the road material in such a way that the tar or bitumen used as a binder is thoroughly incorporated with and completely covers the various stone ingredients of which the road is constructed, as very early experience in this class of road clearly demonstrated that it was doomed to failure unless every portion of the stone or sand used in construction was efficiently uniformly and entirely coated with the binder.

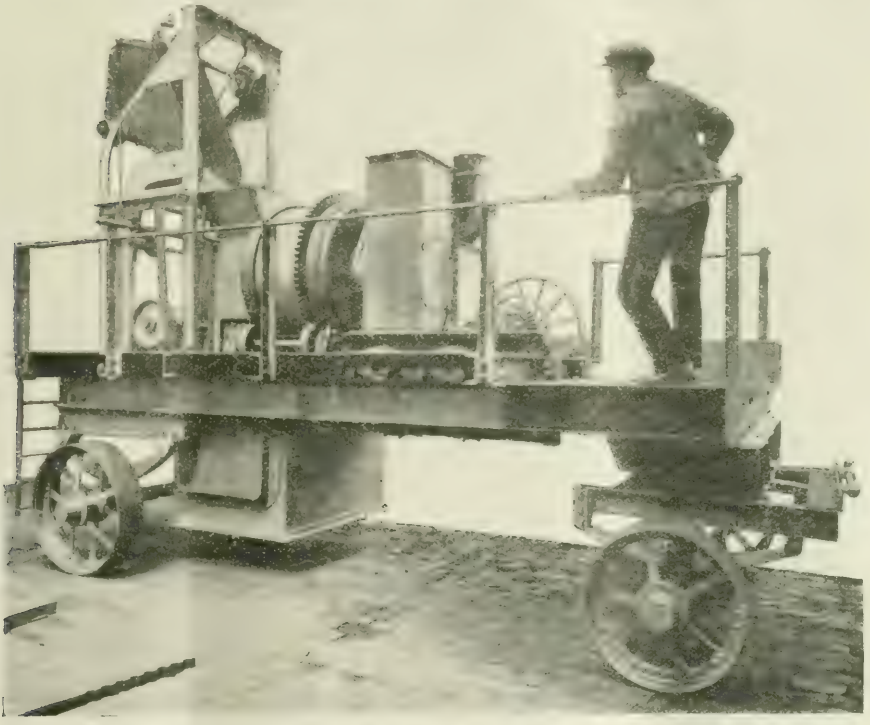
Many types of machines for producing tar-macadam

or bituminous carpet have been introduced from time to time, but their objections have generally been that their successful application was limited to one particular formula for making the road, the difficulty being in the past that, whereas a machine was found quite satisfactory for mixing, for argument's sake, large stone with tar, the same machine, when applied to mixing small stone or sand with bitumen, was by no means a success.

Experience has proved that there is another very important factor governing the creation of a successful tar or bituminous road, quite apart from the mixing of the material before it is put into place, and that is the drying, and, in some cases, the heating to a comparatively high temperature of the stone or sand before it is coated or incorporated with the binder. It is now generally recognised that efficient and thorough drying is absolutely essential if the most satisfactory results are to be obtained, and it is also known that when bitumen is used as a binder the stone or sand must not only be thoroughly dried, but also raised to such a temperature that when the heated bitumen is added to it the whole may be efficiently mixed without the binder being cooled so that it cannot thoroughly cover the stone.

It will be appreciated that the many varying elements connected with tar or bituminous road construction have created for the manufacturers of machinery for the production of the material many difficult problems to the solution of which they have devoted a great amount of time, and have conducted a large number of experiments.

For any given plant it is obviously desirable that the drying process and the mixing process referred to above should be carried out in the same machine. On the other hand, there are essential differences between the procedure necessary to dry the stone or sand and the procedure necessary to mix those materials with the binder. It follows, accordingly, that the two processes cannot be too closely associated without a resultant detriment to the mixture; therefore, while the plant which is to be used for the drying and the mixing should for preference be one compact unit, where necessary capable of being hauled along the roads on a single underframe, the actual vessels in which the drying and the mixing are carried out should be quite independent, so that there may be no confusion or overlapping between the drying and the mixing processes. There is another important point which must be borne in mind, especially when the production of bituminous carpet or bituminous macadam is under consideration -viz., that there is no object served in heating the material after drying to a temperature of, say, 400 deg. Fahr. if a considerable proportion of that heat is lost by the material before it is incorporated with the bitumen. From this it will obviously be seen that the action of transferring the stone or sand after drying and heating in the drying vessel to the vessel in which the mixing will take place should, under ideal conditions, be almost instantaneous. Again, while it is obviously an advantage that the hot gases used for drying the stone or sand should come into intimate contact with the material, it is just as desirable that such hot gases should not come into intimate contact with the binder, whether tar or bitumen, as if such is the case there is a very strong possibility that the binder may become overheated and certain of the essential oils contained therein evaporated, resulting in a reduced elasticity of the binder, which will show itself ultimately in the rapid crumbling away of the road surface constructed.



Side View of Ransome Machine (Fig. 2)

Space does not permit us to deal with all the various factors which have to be taken into consideration in the design and production of an efficient combined drying and mixing plant for road work, as a comprehensive review would easily form the subject-matter of an independent text-book, which, incidentally, we think, would be welcomed by engineers and surveyors if it contained information obtained from actual experience which could be thoroughly relied upon.

We suggested in the opening paragraphs that the question of road making was one of active development within the British Empire, and in this connection, more especially at the present moment, it is interesting to learn that the Municipality of Bombay, India, have recently invested in a combined portable plant for the production of bituminous macadam, from which it may be inferred that India is in no way behind the other parts of the Empire in the construction and development of modern roads.

Some considerable time back Mr. B. H. Hewett, the engineer of the Bombay Municipality, was busy in this country studying the methods of road construction employed and the machinery used therewith, and, as a result of his investigations, the municipality ordered from the Ransome-over-Mehu Machinery Company, Limited, of Brunswick House, Westminster, the machine illustrated in Fig. 1. This illustration is a view taken from the back or feeding end of the plant, and shows very clearly the elevating skip at ground level ready to receive the batch of stone to be subsequently dried within the drying drum. Fig. 2 is a side view of the machine, which shows clearly, first, the substantial road wheels upon which the whole plant is mounted; secondly, at the back end the elevating skip which feeds the stone to the machine; thirdly, the rotating drying drum, adjoining the elevator, below which is suspended the furnace; fourthly, the baffle box and fan, a little to the right of the drying drum, below which is, and suspended midway on the underframe, the mixer.

We are indebted to the Ransome-over-Mehu Machinery Company, Limited, for the following description of the machine:—

Capacity.—The machine illustrated diagrammatically in Fig. 3 is designed for an output of 30 cub. yds. per day of ten hours of mixed material.

This output will vary considerably, according to the nature of the stone or sand being used at any given time, and, as previous experience shows, is capable of being materially increased under favourable conditions and efficient working.

Weight.—The complete machine as described weighs approximately 8 tons 10 cwt.

Horse Power.—The power required to operate the machine is 7 to 8 b.h.p.

Batch Capacity.—The machine works on the batch principle, and a batch constitutes 6 cub. ft. of material.

Fuel.—The furnace is arranged for burning coke, and wherever possible this fuel should be employed, although at times a certain amount of wood fuel is not objectionable, provided excessive smoke is not caused by the combustion of the wood.

Portability.—The complete machine is mounted on serviceable road wheels fitted with springs, fore-carriage and draw-bar. When the machine is at work, however, the road wheels should be securely blocked, and the elasticity of the springs should, for preference, be eliminated by packing between the underframe and the springs.

Feeding.—The machine is fed by means of an elevating skip which descends to ground level at the back end. This skip will hold the batch required—6 cub. ft.—and is supplied with clutch, brake and automatic knock-out. The clutch, which operates on the coil principle, should be maintained with at least half a pint of good, heavy machine oil within the casing. It is not essential that the brake should be lifted when the skip is being raised, but it is desirable as the wear and tear and the load upon the winding gear is diminished thereby. The skip on reaching its discharge position causes its load to descend through an intermediate chute or hopper into the drying drum, which is continually revolving.

Drying Drum.—The length of time any batch of stone or sand needs to remain within the drying drum is very largely dependent upon the atmospheric conditions and the amount of moisture present in the stone as it is delivered to the drying drum.

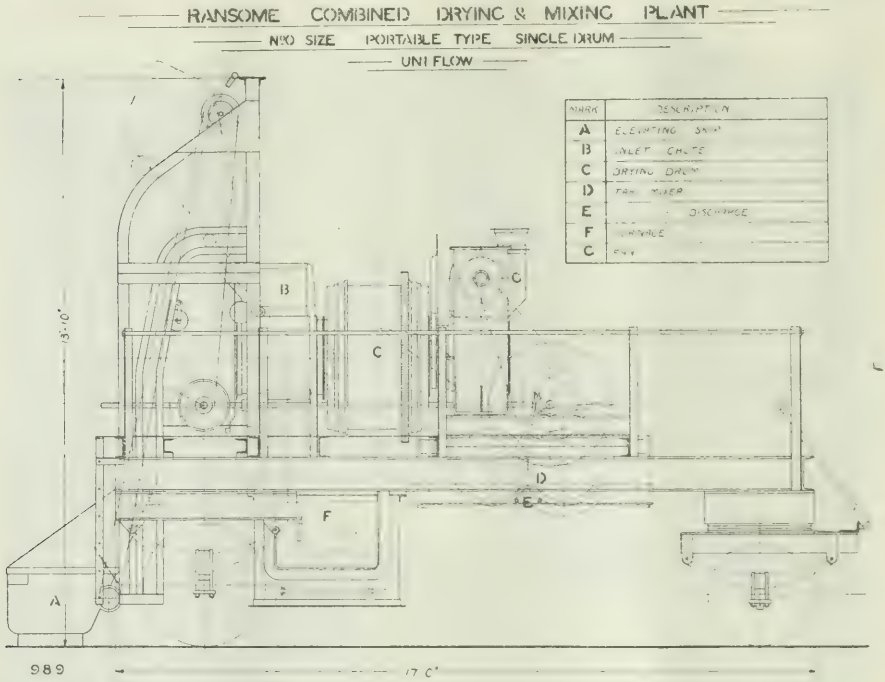


FIG. 3.

Sand will require a greater length of time to dry than stone, and the small stone, as a rule, longer than the large stone. Working on any one day with a uniform size of material, it is generally possible to determine, by carefully observing the first batch passed through the machine, the length of time required for drying the various batches on that particular day.

Discharge.—After the stone has remained within the drying drum for the necessary length of time, it is discharged by means of a chute, under the control of a hand lever situated near the mixer.

Mixer.—The mixer, which is constructed on the double-axle principle, is so arranged that the stone rapidly becomes incorporated and coated with the binder, the average length of time required for complete mixing [illegible] two and a-half minutes, according to the nature of the stone being mixed. It should be noted that immediately the dried batch of stone enters the mixer the next succeeding batch of stone may be lifted by the elevator and caused to enter the drying drum, so that drying and mixing take place simultaneously.

Discharge from Mixer.—Discharge from the tar-[illegible] is controlled by a hand lever operated from the working position. There is no

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And Municipal and County Engineer.

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ground level, so that discharge may take place direct into trucks or carts, as may be necessary in circumstances.

Mixing Blades.—The mixing blades within the tar- [illegible] are of special design, and are arranged [illegible]

Furnace.—The furnace is [illegible] ground [illegible] may be regulated by controlling the fire-door and the ashpit [illegible] in such a manner as to give greater efficiency [illegible] to obtain economy in working, to obtain [illegible] heat is generated.

Working Platform.—A working platform is provided along the side and the front of the machine giving access to the elevator, discharge from the drying drum to the [illegible] to the carts.

Fan.—The hot gases from the furnace are caused to pass through the drying drum under the influence of a fan [illegible] mixer.

In conclusion, it is interesting to note that the machine described above, similar to many which the company have provided to municipalities and contractors in this country, and the results obtained, both from the point of view of efficient drying and mixing, and the minimum amount of labour involved, are extremely satisfactory.

Change of Address. The Dussek Bitumen Company forward us notice of change of address to their additional works at Empress Wharf, Sherman-street, Bromley-by-Bow, E. Certain of the firm's products will still be manufactured at their Deptford works, but all correspondence should in future be addressed to them at the new address.

Electricity for the Working Classes.—The Hull Corporation Electricity Committee have instructed the engineer to prepare a report as to the practicability of supplying electricity to the houses of the working classes. It was stated that with metallic filament lamps, and current at 6d. per unit, electricity would be a cheap illuminant.

Heavy Goods Traffic on Tramways.—A correspondent supplies some further particulars of the scheme of the Leeds Corporation referred to by one of the speakers at the recent Northeastern District meeting of the Institution of Municipal and County Engineers at Doncaster (p. 225 *ante*) for carrying heavy merchandise on their tramways, and so lessening the damage to paving and tramway tracks caused by horse-drawn lorries. It is proposed to employ specially-designed wagons to carry 10 tons each and to be drawn by electric locomotives. As mentioned in the discussion referred to, the charge for transporting goods by this means is calculated at 4d. per ton mile.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Do the [illegible] ways in which the civil population can help in this great war? Was it not a very good idea on the part of the Lambeth Borough Council to issue the following notice to ratepayers?—

"Removal of refuse costs money, wastes labour, necessitates destruction, and hinders personal needs. In the interests of public health, and to help your country and your sons, put all household rubbish."

Is this not an excellent circular, and could not an extension of such suggestions be usefully carried out throughout the country?

* * * *

Apropos of the above, would it not strengthen the hands of the Government enormously if civilians of all classes endeavoured to help in every way in their power to make it easier for the Government to carry on the war without being hampered by the selfishness of the individual?

* * * *

Have the [illegible] *Ingworth v. Barrow Borough Council* case of peculiar interest to all surveyors? Would it not be a "consummation devoutly to be wished" if the law courts could decide, once and for all time, whether a street gully is part of the road or part of the sewer? Does it not seem almost incredible to the road engineer's mind that a gully should for one moment be held to belong to the sewer when there exist in all parts of the country hundreds of gullies which are not connected with a sewer at all? Would not a discussion on this point, in the columns of THE SURVEYOR, be helpful in ascertaining what are the views of surveyors throughout the country?

* * * *

Are not the series of articles by Mr. G. Bertram [illegible] now appearing in the columns of THE SURVEYOR, of more than passing interest? Does not the recent article on "The Purification of Brewery Wastes" contain information of the greatest value to all who have to study sewage problems, and is it not to be hoped that these articles may eventually be published in pamphlet form so that a "book of reference" on these very important questions may be made available?

* * * *

Is not the Roads Improvement Association to be congratulated on having recently written a letter to the Press calling attention to the exceptional weather and traffic to which the roads of this country have been subjected during the past few months? When we consider that the three great enemies to roads—water, temperature, and extraordinary traffic—have been actively at work, is it to be wondered that the highways have suffered abnormally, and is it not a feather in the cap of many road engineers that greater damage has not been caused? Is it not to be hoped that surveyors will accede to the request of the association and communicate with their secretary, Mr. Wallace E. Riche, as to the result of their experience during these trying times?

* * * *

How many institutions or societies have adopted the excellent suggestion of the president of the Society of Architects that members who are serving their country in the Army should not be called upon to pay their subscriptions while on active service? Is not this one of the numerous ways in which those of us who, from no fault of our own, are unable to fight for our country, could show our appreciation of the unselfish action of the gallant men who are taking their part in this great national crisis?

* * * *

Was the suggestion in the *Journal of the Royal Automobile Club* of the 12th inst. put forward seriously—viz., that pedestrians in country roads at night should wear something white—so as to be seen by motorists and thus avoid the danger of being run down? Not only this, but it was suggested that where the roads were white, they should wear something black, so that, if this extraordinary suggestion is to be carried into effect, will it not be necessary for male pedestrians in future to wear white coats and black trousers, or *vice versâ*? And what about female pedestrians? Can they be easily dictated to as to what they shall wear?

Keighley Tramways.—These lines made a total realised surplus of 2s. 6d. on last year's working, so the chairman of the Tramways Committee stated in a debate upon a proposal to increase the general rates by 9d. in the £.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

459. Sewage Sprinkler. Describe an efficient form of sewage sprinkler for percolating filters which requires very little head of sewage to work it. (J. R. H., *Ipswich.*)

460. Sewage Sea Outfall.—Are reinforced-concrete pipes better than cast-iron pipes for a sewage outlet into the sea, which is covered at high water? Compare them as regards initial expense and maintenance. (J. R. H., *Ipswich.*)

461. Applied Mathematics.—Give some simple examples of the application of the calculus to the solution of practical engineering problems. (Student.)

463. Bomb-proof Dug-out.—Give sketches of a bomb-proof dug-out to hold five people. (Tico.)

464. Masonry Arch.—State three ways in which a masonry arch may fail, and describe the cause of each. (J. F., *Padiham.*)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

457. Hydraulics.—A common formula for the mean velocity of flow in streams and artificial channels is $v = c\sqrt{m.i}$. Explain carefully the meaning of the various factors on the right-hand side of the expression and state how the values of c for various kinds of channels have been determined.

The formula quoted is Chezy's formula for the mean velocity of flow in channels, &c., and is obtained as follows. If we have a channel of constant size and slope, whose supply does not vary, the flow is said to be uniform, and the height of flow at any two sections is the same. The weight of water passing any section during one second = w.

Ft.-lb. of water per sec. = $w.a.v.h$

where w = weight of cub. ft. of water; a = area of cross section; v = velocity (mean) in ft. per second; h = height through which water falls in length l.

Since, however, the velocity remains uniform, this kinetic energy is spent in overcoming friction with the sides of the channel and in eddies, &c.

Resistance of friction = $F \times p \times l \times v^2$

where F = frictional resistance per cub. in. area of channel; p = wetted perimeter; l = length; v = velocity ft. per second.

$\therefore F.p.l.v^2 = w.a.v.h$

$$F = \frac{w.a.v.h}{p \times l}$$

$\therefore F = w.m.v$

Now $\frac{l}{l}$ = hydraulic radius = m

$\frac{h}{l}$ = inclination = i

There is a connection between F, the friction and v, the velocity, and it is found by experiment that F is approximately proportional to the square of the mean velocity. Therefore, if C is a constant, the mean velocity is

$$v = C\sqrt{m.i}$$

This is the formula put forward by Chezy in 1775 (sometimes r is used instead of m and s instead of i).

To obtain C for any particular case, m, the hydraulic radius, and $i = \frac{h}{l}$ are measured from the sections of the channel considered; v, the mean velocity, is obtained either by means of floats or, if the stream be small, passing it over a weir and measuring the discharge, and obtaining v from the formula

$$v = \frac{q}{a}$$ where q = discharge in cub. ft. per second, a = area of flow.

These values are then put into the equation,

$$\text{and } C = \frac{v}{\sqrt{m.i}}$$

An average value for C for circular conduits is about 125, while for channels filled with weeds, &c., it may drop to 50 or even 30. The way that C increases with the increase of v and a, &c., can be well seen from tables. Some good extracts are given in Merriman's Hydraulics. Among empirical formulæ for determining the value of C, one brought out by Ganguillet and Kutter in 1869, and known as Kutter's formula, might be cited, and is as follows:—

$$c = \frac{\frac{1{\cdot}811}{n} + 41{\cdot}65 + \frac{0{\cdot}00281}{s}}{1 + \frac{n}{\sqrt{r}}\left(41{\cdot}65 + \frac{0{\cdot}00281}{s}\right)}$$ where s = the inclination or slope, r = hydraulic radius.

n is an abstract number whose value depends upon the roughness of the surface. A few values of n are, for brickwork = 0·013, for sewers = 0·015, for average rivers = 0·030. (N. S. J., *Darlington.*)

462. Projectiles.—Establish a formula for determining the angle at which a projectile should be discharged to secure the maximum range. (T. R.)

Let the required angle be a, and the initial velocity u. Then the vertical component is $u \sin a$, and the horizontal component is $u \cos a$.

The vertex A is the highest point of the path, and the tangent at A is horizontal; therefore the projectile is moving horizontally at A.

$\therefore$ the vertical velocity at A is 0

Let t = time required to reach A

Then $0 = u \sin a - gt$

hence $t = \frac{u \sin a}{g}$

The total time of flight, up and down $= \frac{2u \sin a}{g}$

and the constant horizontal velocity $= u \cos a$

The horizontal distance $s = u \cos a \times t$

$$= \frac{u \cos a \times 2u \sin a}{g}$$

$$= \frac{u^2}{g} 2 \cos a \sin a$$

$$\therefore \text{Horizontal range} = \frac{u^2}{g} \sin 2a$$

Obviously the range will be greatest when $\sin 2a$ is greatest, i.e., when $\sin 2a = 1$. The $2a$ will be 90 deg., and a = 45 deg. (J. F., *Padiham.*)

Electric Cookers for Municipal Houses.—Barnes Urban District Council, who owns several workmen's dwellings, and are building others, have decided to instal electric cooking apparatus in each of the dwellings. A type of cooker suited to the needs of the workman's wife has been selected. The oven accommodates a joint weighing 4 lb. or 5 lb., and makes provision for cooking puddings and pastry. Current will be supplied at ¾d. per unit—a very low rate for Greater London. Prepayment meters will be used, the charge being so adjusted as to secure the repayment of the capital expenditure at the rate of about 3s. 6d. per quarter.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible*

INQUIRIES HELD.

Bognor U.D.C. (February 22nd. Mr. Courtenay Clifton).—£1,928 for the erection of workmen's dwellings. There were three schemes involved in the proposal. (1) The erection of groups of semi-detached houses in Upper Lindfield-avenue, costing £1,080; (2) the purchase of additional land in Upper Lindfield-avenue at £128, and (3) the purchase of land at Sheepwash-lane at £720. The surveyor, Mr. Oswald Bridges, stated that the type of house adopted by the council had been built in other parts of the country for £225 each. He did not think he could do it for the same sum, as he was asking for £230. The houses would contain a large living-room, 13 ft. 6in. by 12 ft. 6 in.; a parlour, 12 ft. 6in. by 10 ft.; scullery, pantry, two bedrooms and a bath-room. Each house would have a frontage of 25 ft. There had been an increase in prices since the estimate was prepared, but in chalk concrete and timber, the only materials the cost of labour would increase. He had eighty applications for the cheaper class of cottages and five applicants for the larger type of cottages.

Bridlington T.C. (February 5th. Mr. Edgar Dudley).—£300 for the purchase of land for the purpose of making a street from St. John's-avenue South to Midway-avenue.—It was stated that it was proposed to pay 35 6d per yard for the land. The estimated cost of the street works was £400.

East and West Flegg (Norfolk) R.D.C. (February 17th. Mr. Courtenay Clifton).—£1,700 for the purchase of land and the erection of workmen's dwellings.—The surveyor, Mr. Alfred William Hobbs, stated that he had prepared plans for seven houses. They would each have downstairs a sitting-room, 14 ft. by 11 ft. 6 in., with a height of 8 ft., a kitchen, pantry or larder, wash-house, coal store, and earth-closet. Upstairs they would have three bedrooms, each with separate entrance. The front room would be 14 ft. by 11 ft. 6 in., and the back rooms 9 ft. by 8 ft. Each house would have 7 or 8 rods of land at the back for a garden. Such houses could accommodate a man and his wife and a family up to seven. The land, which comprised 11 acres, was to cost £120.

Penistone U.D.C. (February 5th. Mr. F. O. Stanford).—£1,500 for providing pumping plant at the Ewe-common water station and to meet the cost of laying the mains for the town supply of water.—Mr. C. Champan, engineer, stated that it was proposed to instal a direct-acting borehole steam engine to be driven by a Crossley gas engine. The pump was of 11 in. diameter barrel with 4ft. stroke, the pump to be fixed 15 ft. from the floor to the surface of the foot valve. As to price, the engine would be £432, and fixing £135. The cost of boiler and removal was £200; £150 was put down as the estimate of cost of a house for the engine and he did not altogether approve of the adoption of a corrugated-iron building on account of its short life.

Ramsgate T.C. (February 10th. Mr. Edgar Dudley). £396 for the widening and improvement of Southwood-road. It was stated that the present width of the road varied from 12 ft. 6 in. to 20 ft., and it was proposed to widen the thoroughfare so that at its narrowest it would be 29 ft. 6 in. wide, and at its widest 35 ft. 6 in.

Surbiton U.D.C. (February 17th. Mr. R. G. Hetherington).—£4,900 for the balance of the expenditure on the scheme of sewerage and sewage disposal for the district.—In the course of the proceedings it transpired that the council had paid to the contractors (Messrs. Dick, Kerr & Co.) a bonus of £500 for completing the work five months in advance of the scheduled time, and the inspector pointed out that the Local Government Board auditor had objected to the inclusion of this bonus under the head of capital. Among those present were Messrs. H. T. Mather, surveyor to the council, and A. P. I. Cotterell, M.INST.C.E. (joint engineers for the scheme), and Mr. V. J. Hardwick, architect for the workmen's cottages erected on the work.

APPLICATIONS FOR LOANS.

Bognor U.D.C.—£150 for surface-water drainage.

Buckie T.C.—£1,399 for water supply works, sewerage, and roads.

Coventry T.C.—£3,090 in respect of the second portion of the Leicester-street rehousing scheme.

Farnham R.D.C.—£900 for road widening.

Harrogate T.C.—£1,662 for making up certain streets.

Ipswich T.C.—£5,200 for the purposes of the refuse destructor.

Isle of Ely C.C.—£3,000 for a new school at Whittlesey and £190 for alterations to a school.

Kent C.C.—£3,512 for lithophalt paving works and £1,600 for wood paving at Maidstone.

Ogmore and Garw U.D.C.—£780 for sewerage works.

Sedgley U.D.C.—£3,000 for the purposes of gas lighting.

Southend T.C.—£1,100 for a police station at Leigh.

Stratton and Bude U.D.C.—£1,000 for water main extension.

Tiverton R.D.C.—£450 for works of water supply.

Wigton R.D.C.—£320 for works of water supply.

Wroxham T.C.—£4,000 for the provision of artisans' dwellings.

LOANS SANCTIONED.

Armagh R.D.C.—£11,560 for labourers' cottages.

Battersea B.C.—£31,500 for the electricity undertaking.

Bridlington T.C.—£16,000 for the purchase of the estate of the New Spa and Gardens Company.

Burnley R.D.C.—£380 for works of water supply.

Grays U.D.C.—£896 for public conveniences.

Heckmondwike U.D.C.—£468 for the purchase of land for works of sewage disposal.

Hoylake U.D.C.—£650 for the extension of the parade gardens.

Orsett R.D.C.—£450 for a new road.

Littlehampton U.D.C.—£200 for sewer ventilators.

Skipton U.D.C.—£100 for sewage works extension.

Tamworth T.C.—£1,700 for sanitary improvements.

Tetbury U.D.C.—£825 for boxing a well and test pumping at the waterworks.

FORTHCOMING INQUIRIES.

	MARCH.	£
1	**Edmonton.** For the purposes of public baths and street improvement (Mr. R. H. Beckwith)	2,544
2	**Brierfield.** For the conversion of a bowling green and works of sewage disposal (Mr. A. W. Brightmore)	8,000
2.	**Carlisle.** For works of water supply (Mr. R. G. Hetherington)	59,250
2	**Cheadle.** For the purpose of sewage disposal works (Mr. W. M. Cross)	2,100
2.—	**Mansfield.** For works of sewage disposal (Mr. P. M. Crosthwaite)	2,075
2.—	**Rickmansworth.** For the purposes of street improvements (Mr. Edgar Dudley)	3,000
2	**Rothbury.** For road improvement (Mr. M. K. North)	1,500
2	**Tadcaster.** For the purposes of water supply (Major J. Stewart)	900
3	**Gosforth.** For street lighting purposes (Mr. H. R. Hooper)	737
3.—	**Newcastle-upon-Tyne.** For the provision of public baths (Mr. M. K. North)	29,700
3	**Settle.** For works of water supply (Mr. A. W. Brightmore)	3,100
3.	**Stoke-on-Trent.** For the purposes of sewage disposal and a refuse destructor (Mr. W. M. Cross)	1,540
4.—	**Doncaster.** For the purposes of water supply (Mr. P. M. Crosthwaite)	2,700
4.	**Friern Barnet.** For the provision of an open space (Mr. Edgar Dudley)	6,259
4.—	**Goole.** For the provision of a coal carbonising plant (Mr. H. R. Hooper) ...	13,000
4.—	**Meriden.** For works of sewage disposal (Mr. W. M. Cross)	3,820
4.—	**Southport.** For the purposes of the "Lagoon Site" (Major J. Stewart)	9,000
4.—	**Tingley.** For works of water supply (Mr. M. K. North)	2,000
5.—	**Cockermouth.** For works of sewage disposal (Mr. R. G. Hetherington) ...	800
5.—	**Heywood.** For electricity purposes (Mr. H. R. Hooper) ...	12,460
5.—	**Rotherham.** For the provision of a motor ambulance (Mr. M. K. North)	600
5.—	**Wickersley.** For works of sewerage (Mr. P. M. Crosthwaite)	102

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Louth, Merthyr; housing and town planning—Stourbridge, Wrexham; roads and materials—Exeter, Wilts; sewerage and sewage disposal—Branston, Chipping Norton, Clayton; water, gas and electricity—Rotherham, Stirling, Stratton and Bude. —Particulars of other projected works will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Abingdon T.C.—It is proposed to erect a fire station at an estimated cost of £700.

Coleraine R.D.C.—The council have decided to erect a permanent bridge at Tirkeeran to take the place of the one washed away in the recent floods. The county surveyor estimates the cost of the structure at £600.

Halifax T.C.—The question of the provision of new slaughter-houses is being considered by the town council.

Henley-on-Thames T.C.—It is proposed to purchase baths on the Thames bank, and to adapt them as public baths, at an estimated cost of £1,000.

Kent C.C.—It has been decided to build a new house for the senior medical officer in the grounds of Chartham Asylum, at an estimated cost of £1,500.

Louth C.C.—A scheme has been agreed to for the erection of county offices in Dundalk, at an estimated cost of £6,000.

Merthyr T.C.—A scheme has been approved for extending the town hall and establishing a public library in the vicinity.

Norwich T.C.—Plans have been approved for the conversion of premises in Duke-street into a workshop for the electricity department, at an estimated cost of £200.

Rochford R.D.C.—The council have approved plans for the enlargement of the Sutton Ford isolation hospital, at an estimated cost of £2,000. The hospital is administered jointly by this council and the Shoeburyness Urban District Council.

Southampton T.C.—The borough surveyor, Mr. J. A. Crowther, has completed plans for adapting premises in Romsey-road as wash baths, at an estimated cost of £1,700.

Woking U.D.C.—The council have forwarded to the county council the plans prepared by the surveyor, Mr. G. J. Wooldridge, for the rebuilding of Hermitage Bridge. Mr. Wooldridge estimated the cost of carrying out the work at £2,550, plus any amount which might be payable to landowners affected. The surveyor assumed that the earth necessary for forming the approaches and embankments might be obtained from land in the immediate vicinity, and that no charge would be made for the land over which the new bridge and approach roads would be constructed.

HOUSING AND TOWN PLANNING.

Billinge U.D.C.—The surveyor, Mr. A. Darlington, has received instructions to prepare a scheme for the provision of workmen's houses.

Crick R.D.C.—It is proposed to carry out a housing scheme at an estimated cost of £1,200.

Stourbridge T.C.—A site has been approved for the erection of twenty houses.

Torrington R.D.C.—The council are seeking the sanction of the Local Government Board to a housing scheme.

Wrexham T.C.—It is proposed to erect thirty houses, at a rental of from 5s. 6d. to 5s. 9d. per week, on land belonging to the corporation.

PARKS AND OPEN SPACES.

Kidderminster T.C.—An estimate is to be obtained for laying out three tennis courts in Brinton Park.

St. Helens T.C.—The Parks Committee have received intimation that the Local Government Board have decided that at the present time they cannot properly sanction the borrowing of £2,200 for the laying out of the Hardshaw playing fields on the present site, which they were advised was not a suitable one. The board thought that a small sum expended upon drainage and the provision of gymnastic appliances would be sufficient.

REFUSE COLLECTION AND DISPOSAL.

Ipswich T.C.—The council have accepted the tender of Messrs. E. Catchpole & Sons, Limited, at £1,630, for the enlargement of the refuse destructor, the tender of Messrs. Heenan & Froude at £3,137 for the destructor cells, boiler, and flue connections, and the tender of Messrs. Royce, Limited, Manchester, at £185, for the electric crane to lift the clinker into the wagon on a portable railway placed on the top of the clinker heap.

ROADS AND MATERIALS.

Annfield Plain U.D.C.—Plans have been approved for making up Back Wesley-terrace.

Brentford U.D.C.—An intimation has been received that the Road Board have sanctioned a grant of £6,000 towards the cost of the Ealing-road improvement scheme.

Burnley R.D.C.—A loan of £3,480 is being arranged for the purpose of private street works.

Cardiff T.C.—The Public Works Committee have forwarded to the Monmouthshire County Council a suggestion that a road should be constructed between Cardiff and Newport, and thus avoid the hills.

Clutton R.D.C.—The council are considering a road widening scheme between Hallatrow and Paulton, which is estimated to cost £392.

Coventry T.C.—It has been decided to widen Clarence-street, at an estimated cost of £1,460.

Exeter T.C.—Wood-paving works estimated to cost £13,080 have been approved, as well as granite sett paving, which is estimated to cost £12,933.

Glasgow T.C.—The council last week approved the scheme of a joint committee for an improvement at Glasgow Cross. The approximate price of the properties which it is proposed to purchase in connection with the scheme is £40,000.

Huddersfield T.C.—It has been agreed to carry out an improvement at the junction of New North-road and West-parade, at an estimated cost of £1,575.

Louth T.C.—The tender of Messrs. Ruston & Proctor, at £557, has been accepted for the supply of a steam road roller.

Newport (Mon.) T.C.—The new roadway on the Riverside has been completed, and it was formally taken over by the Works Committee last week, after it had been severely tested by running three steam rollers, first in line and then abreast, along the roadway. The wall is built entirely of ferro-concrete founded on piles, and provides facilities for the local boatmen in the way of steps. The tests were supervised by the borough engineer, Mr. Tremelling, Assoc.M.Inst.C.E.

Stoke Newington B.C.—The council have offered to join the Shoreditch Borough Council in forming a deputation to the London County Council with reference to the widening of Old-street and Kingsland-road.

Wandsworth B.C.—The council have agreed to the construction of junction tramlines from Tooting High-street into Mitcham-road.

Wilts C.C.—The council have agreed to carry out the improvement at May's-corner, Chiseldon, subject to the Road Board contributing £460 towards the cost. —An estimate of £5,000 for tar-spraying has been approved.

SEWERAGE AND SEWAGE DISPOSAL.

Alton U.D.C.—The surveyor, Mr. G. E. Hartley, has received instructions to prepare a further scheme of surface-water drainage.

Branston R.D.C.—It has been agreed to carry out the Boultham sewerage scheme prepared by the sanitary surveyor, Mr. T. R. Howitt. The estimated cost of the work is £3,500.

Bridgwater T.C.—The Local Government Board having refused a loan of £1,100 for a proposed sewerage scheme for the Chilton district because the project "could not be regarded as satisfactory," the council

were appointed a sub-committee to submit further proposals for the work.

Chipping Norton T.C.—The council have taken up a loan of £9,852 for works of sewage disposal, and the matter is to be brought forward for a further loan of £1,657 for a similar purpose.

Clayton (Yorks) U.D.C.—The council have approved the amended estimate of the sewerage scheme submitted by Messrs. G. Wilson & Sons, Manchester. The additional cost, bringing the total to £6,003, is necessitated by the requirements of the Local Government Board.

Ripon T.C.—A letter has been received from Colonel Ellis, representing the War Office at Ripon, informing the council that the War Office had accepted the offer of the corporation to allow them to use land at a small rent at the municipality's sewage disposal works. The extra sewerage would be carried through and the disposal works constructed and worked by the War Office.

WATER, GAS, AND ELECTRICITY.

Abingdon T.C.—Waterworks extensions are to be carried out at an estimated cost of £450, and water mains provided at a cost of £200.

Blackburn T.C.—The question of erecting new electricity works at Whitebirk is under consideration.

Coventry T.C.—The Electric Light Committee have been authorised to grant flat rates to supply light in artisans' dwellings erected by the corporation. The rates were: For a house containing three lamps, 7d. per week; for a house containing four lamps, 9d.; the charges including the provision and maintenance of lamps.

Derby T.C.—The number of customers for electricity, both for lighting and power, continues to increase. The total capital expenditure on this enterprise has reached the sum of £367,210, of which £226,789 has been repaid. The gross profit of £21,895 for the year ended March last showed an improvement. Very large sums are spent annually on renewals, repairs, and maintenance, together with the repayment of stock and mortgages. The profit on the waterworks account increased from £31,206 to £32,758, after the deduction of the Derwent Valley contribution of £25,761, of which £4,691 was charged to the general district rate, and £4,831 to the special water fund account, which shows the substantial reserve of £261,857.

Driffield R.D.C.—Particulars of a proposed water supply for Foston and Middlecave-cum-Wharram have been forwarded to the Local Government Board with a request for a loan to meet the cost of the scheme.

Hull T.C.—The electrical engineer has received instructions to report on the advisability of an electricity scheme for public lighting and domestic cooking.

Llandudno U.D.C.—The council have accepted tenders for a 300 kw. dynamo and 440 b.h.p. engine, with additional induced draught plant, at a total cost of £1,720, for the electricity works.

Rotherham R.D.C.—The council are considering the question of improving the water supply at Beston Levitt and Wickersley by the provision of a reservoir.

Stirling T.C.—The council are considering the question of extending the electricity works.

Stratton and Bude U.D.C.—It has been agreed to lay a new main from Stratton to Bude for conveying water to augment the present supply to the high levels.

Swanage U.D.C.—The question of a new boring for water on land near Woodhouse, Studland, is engaging the attention of the council.

Tenby T.C.—The council have decided to apply for an electric lighting Provisional Order in the present session of Parliament.

Tetbury U.D.C.—Tenders are being invited for sinking a well 400 ft. deep and 14 in. in diameter, and for test pumping at the waterworks, the estimated cost of the works being £825.

Tredegar U.D.C.—The council are negotiating for the purchase of land for the construction of waterworks. About ¾ acre of land is required for the settling tanks and storage accommodation, and the length of the pipe track was given as 3,537 yds.

MISCELLANEOUS.

Bangor (Ireland) U.D.C.—With reference to the application of the council for a loan of £1,180 with which to provide fire extinguishing appliances, and the statement of the Local Government Board in their letter of December 16th, that they were not prepared to sanction so large a sum, but that they would consider an application for sanction to the borrowing of a smaller sum for the provision of a suitable vehicle to carry a fire escape and a number of firemen with hose and tools, the town clerk stated that he had made inquiries and had ascertained that a suitable vehicle to carry firemen and fire escape would cost £500, and at least £100 would be required for housing the apparatus. It was decided to forward an amended application to the Local Government Board for a loan of £600 for this purpose.

Derby T.C.—The corporation tramways have been yielding an increasing return, the nett profit having grown in three years from £5,183 to £8,192. Stock has been paid off in excess of requirements to the extent of as much as £17,318, while the renewals fund account, even if never needed, constitutes a valuable reserve.

PERSONAL.

Mr. Allan W. Ritchie, chief sanitary inspector, Edinburgh, has been elected a member of the Royal Sanitary Institute.

Mr. W. A. Cutting, assistant to the borough surveyor of Hertford, has been appointed assistant surveyor to the Goole Urban District Council.

Mr. E. A. Murphy has been appointed temporary engineer to the Carlow Urban District Council in the absence of Mr. Douglas, who is engaged on military duty.

Mr. A. P. I. Cotterell, M.Inst.C.E., president of the Institute of Sanitary Engineers, on Wednesday gave an address on sanitary service to the members of the Birmingham and Midland Centre of the institute.

Second Lieutenant Alan D. Hetherington, of the 12th Durham Light Infantry, who was for several years in the surveyor's department of the Ealing Town Council, joined his battalion at Sandhurst recently after completing his course of training.

Mr. S. R. Hooper, surveyor to the St. Austell Rural District Council (Eastern Division), has had his salary advanced from £130 to £160 a year to enable him to provide more efficient means of locomotion, it being understood that he should purchase a motor bicycle.

Mr. W. H. Prescott, engineer to the Tottenham Urban District Council, has received the permission of the council to accept a commission in the Royal Engineers, and he has been granted such salary as, with his service allowance, will be equivalent to the civil pay he has been receiving.

Mr. J. Louden, burgh surveyor of Bo'ness, was recently publicly thanked at the town council meeting for his services in respect of an official grant in relief of unemployment. Provost Grant stated that Mr. Louden's work in this instance was on all fours with everything else he took in hand—it was well done.

Mr. W. Olver, surveyor to the Newton Abbot Rural District Council, who is about to take up his new duties as one of the assistant surveyors for Cornwall, took farewell of the members of the rural council recently, and thanked them for the courtesy and kindness they had shown him during nearly sixteen years' service. The chairman, Mr. H. H. Hannaford, J.P., C.C., on behalf of the council, said they wished Mr. Olver every success, and hoped he would do credit to the training he had received at the hands of the Newton Council. He hoped when Mr. Olver got down to Cornwall he would open their eyes, and let them see that all the surveyors did not live in that county. He urged Mr. Olver to try and improve the Cornish authorities a bit, and hoped in years to come he would meet with success. They were all very sorry to lose his services, but very glad that he was improving his position.

In the important case of *Papworth v. Battersea Borough Council*—the judgment in which, delivered last Saturday, is the subject of an editorial in the present issue—evidence for the defendants was given by Mr. T. W. A. Hayward, M.Inst.C.E., F.S.I., the borough engineer, and his two assistants, Mr. Dresden and Mr. White, and was supplemented by the evidence of Mr. H. Percy Boulnois, M.Inst.C.E., Westminster, and Mr. A. E. Collins, M.Inst.C.E., city engineer of Norwich. Mr. Hy. H. Foster, F.S.I., Balham, was one of the witnesses for the plaintiff.

FOR OTHER ADVERTISEMENTS
See End of Paper.

BOROUGH OF CHELMSFORD.
BOROUGH ENGINEER'S DEPARTMENT.

Applications are invited for the following appointments (temporary) to replace clerks who have enlisted:—

(a) Clerk: £2 2s. per week.
(b) Stores Clerk: £1 10s. per week.

Previous Municipal experience essential for appointment marked (a).

Applications to be made on Forms obtainable from Mr. Percival T. Harrison, ASSOC.M.INST.C.E., Borough Engineer and Surveyor, Municipal Offices, Chelmsford.

GEORGE MELVIN,
Town Clerk.

Municipal Offices,
Chelmsford.
February 24, 1915. (2,412)

URBAN DISTRICT COUNCIL OF ENFIELD.
TO CONTRACTORS.

The Council invite Tenders for Making Up the following Private Streets in their District—viz.:—

Queen's-road, Enfield.
Stanley-road, Enfield.

Plans and Specifications can be seen, Form of Tender and all information obtained, on application to Mr. Richard Collins, the Council's Surveyor, at these Offices, any day (except Saturday) between the hours of 9 a.m. and 5 p.m.

The Contractor will be required to observe Trade Union hours of labour and to pay wages according to the published scale of the London County Council for the time being in force.

Separate Tenders for each road (on the Form supplied only) to be sent in to me not later than noon on Wednesday, the 10th day of March next, endorsed "Tender for ——."

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
T. W. SCOTT,
Clerk.

Public Offices,
Enfield, Middlesex.
February 25, 1915. (2,416)

TWICKENHAM URBAN DISTRICT COUNCIL.
CONTRACTS.

The above Council hereby invite Tenders for the undermentioned Goods or Materials for a period of one, two, or three years from the 1st April next.—

1. Ballast, Shingle, Flints, Gravel and Sand.
2. Granite Cubes and Setts.
3. Portland Cement.
4. Coal and Coke.
5. Fodder and Forage.
6. Oil and Colourman's Goods.
7. Iron Castings.
8. Street Gullies and Drain Pipes.

Forms of Tender and Specification for the whole of the above may be obtained on application to Mr. Fred. W. Pearce, F.S.I., Surveyor to the Council, Town Hall, Twickenham.

Sealed Tenders, endorsed "Tender for ——," are to be delivered to me, by hand, or by registered post, on or before noon of Thursday, the 11th day of March, 1915.

The Council does not bind itself to accept the lowest or any Tender, and any person whose Tender is accepted may be required to enter into a proper Contract with, if required, two sureties, to be approved by the Council.

The tenderer whose offer is accepted shall be held to have bound himself to an agreement, and may be compelled to carry out the obligations arising from his Tender, even though he may not have signed a formal Contract.

(By order)
H. JASON SAUNDERS,
Clerk to the Council.

Town Hall,
Twickenham.
February 25, 1915. (2,414)

BOROUGH OF CHELMSFORD.
PUMPING PLANT AT ADMIRAL'S PARK WATERWORKS.

The Town Council of Chelmsford invite Tenders from Engineers for Pumping Machinery, and for the Provision and Erection of a Pumping Installation, complete with all incidental works, at their Admiral's Park Waterworks, situate in the Borough.

Forms of Tender, Plans and Specification may be obtained on application to Mr. Percival T. Harrison, ASSOC.M.INST.C.E., Borough Engineer, Municipal Offices, Chelmsford, on and after 3rd March next, upon depositing the sum of Two Pounds Two Shillings (£2 2s.), which will be refunded upon receipt of a *bonâ-fide* Tender and the return of the document supplied.

Tenders (which must be on the Form provided), enclosed in sealed envelopes, and endorsed "Pumping Plant," must be delivered at my Office by not later than 5 o'clock p.m. on Wednesday, 17th March next.

The Contract will contain a clause providing that the Contractor shall, so far as regards any work executed in the Borough, pay rates of wages not less favourable than those commonly recognised by employers in the Borough for the particular class of work to be performed under the Contract.

The Council do not bind themselves to accept the lowest or any Tender.

GEORGE MELVIN,
Town Clerk.

Municipal Offices,
Chelmsford.
February 26, 1915. (2,415)

GOOLE URBAN DISTRICT COUNCIL.

The Highways and Sewers Committee of the Goole Urban District Council invite Tenders for the Supply and Delivery of the undermentioned Materials for the year ending 31st March, 1916.

1. Broken Granite.
2. Slag.
3. Tarred Slag Macadam.
4. Concrete Flags.
5. York Stone Flags.
6. Kerb.
7. Channel.
8. Stoneware Pipes, &c.
9. Portland Cement.
10. Gravel and Sand.
11. Coal.

Forms of Tender, Specification and any other information required can be obtained on application to Mr. J. H. Castle, Engineer and Surveyor, Council Offices, Goole.

All Tenders, addressed to the Chairman, must be returned not later than noon on Wednesday, the 10th March, 1915.

Tenders not on the authorised Form will not be considered.

The lowest or any Tender will not necessarily be accepted.

ROBERT TYSON,
Clerk to the Council.

Council Offices,
Goole. (2,413)

BOROUGH OF KING'S LYNN.

The Corporation invite Tenders for the Supply of Road Materials for the year ending 31st March 1916.

Full particulars may be obtained on application to the undersigned, to whom sealed Tenders, on Forms and in envelopes supplied, must be delivered, accompanied by Samples, not later than 10 a.m. Saturday, 13th March, 1915.

The Corporation does not bind itself to accept the lowest or any Tender.

ALFRED J. SMITH,
Borough Surveyor.

Town Hall, King's Lynn.
February 26, 1915. (2,411)

THAMES BALLAST.—Plot of land, with small dock on banks of Thames, containing large quantity of first-class Thames Ballast, to be leased on flat rent and with royalty. Property abuts on a main road, and four barges can be loaded at same time direct from the plot. Offers (per cubic yard) and inquiries are invited.—Apply Pegge & Billinge, Solicitors, 12 Booth-street, Manchester. (2,410)

ROTHERHAM BOROUGH SURVEYORSHIP.

MR. SHACKLETON WITHDRAWS.

As reported recently in THE SURVEYOR, the Rotherham Town Council appointed as their borough surveyor Mr. William Shackleton, A.M.INST.C.E., borough surveyor of Nelson, at a salary of £500, rising to £700. Since then Mr. Shackleton has been granted an advance of salary by the Nelson Corporation, and as a result he has decided to retain his position at Nelson. Mr. Shackleton's decision to remain in the borough has given much satisfaction, more particularly as the town council have several important schemes in hand at present.

The vacancy at Rotherham has been filled by the appointment of Mr. T. P. Collinge, ASSOC.M.INST.C.E., borough engineer and surveyor of Mansfield.

EXETER CITY SURVEYOR RESENTS A SLUR.

At a meeting of Exeter City Council on Tuesday the mayor (Mr. J. G. Owen) presiding,

Mr. Percy Gayton, in accordance with notice given, moved that a special committee be appointed to inquire into the question of direct employment of labour by the council, and to report as to the best means to be employed to secure efficiency and economy in all the departments of the council. He said (the *Western Morning News* reports) the council had a right to know whether the complaints made of uneconomical employment of direct labour were due to faults of the workmen or of the officials. Was the council employment merely a convalescent home for workmen, or were the workmen worse or better than those employed outside? If it was not the fault of the workmen, whose conditions of employment were better than those outside, then it was the fault of the arrangements in the surveyor's department. In either case the question should be tackled. Why was direct employment a success in the water and electric light departments and not in the surveyor's department? He asked that the inquiry should be searching, sincere, and impartial.

Mr. J. A. Loram seconded, saying it seemed to him to be an Irish way of doing things to reduce the number of workmen employed, as the recent tendency had been, and at the same time to increase the number of officials.

The city surveyor (Mr. T. Moulding) said the resolution of the council passed six weeks ago would only affect seven workmen. Mr. Gayton had said he estimates had often been exceeded. He challenged him to point them out.

The mayor (interrupting) said if the committee was appointed the surveyor would have an opportunity of being heard.

The city surveyor: But it is a slur upon my character in my profession. I have made estimates amounting to about £26,000 last year, and instead of exceeding the cost they had saved £500 on the estimates.

The motion was put to the vote and lost.

The mayor: That, gentlemen, clears the air.

Housing from the Sanitary Inspector's Standpoint.

This was the title of a short paper read by Mr. H. Dryland, of the sanitary department, Manchester, at last Friday's meeting of the Royal Sanitary Institute in that city. The paper dealt chiefly with the legal powers for closing, demolishing, or improving insanitary houses, obtained under the Housing and Town Planning Act, 1909. In the discussion which followed the reading of the paper, some of the difficulties of dealing with insanitary properties were voiced, and one speaker wished to know how the reader of the paper would deal with an insanitary house under a sanitary workshop. The house under the shop was unfit for habitation, but the workshop above was quite fit for working in. If they got an order to demolish the house they could not carry it out without demolishing the workshop, which they had no right to do. This is not impossible from an engineering or architectural standpoint, but whether the game would be worth the candle is another matter. The opinion was expressed that back-to-back houses could be condemned as unfit for habitation on account of the difficulty of properly ventilating them.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 1.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SURVEYOR AND INSPECTOR.—February 27th.—Salcombe Urban District Council. £70 per annum.—Mr. C. E. Turner, clerk.

JUNIOR DRAUGHTSMAN.—March 1st.—Corporation of Stockport. £2 5s. per week.—Mr. J. Atkinson, borough surveyor.

TEMPORARY DRAUGHTSMAN.—March 1st.—Corporation of Stockport. £2 2s. per week.—Mr. J. Atkinson, borough surveyor.

SUPERINTENDENT OF HIGHWAYS.—March 1st.—Corporation of Oxford. £180—£200 a year.—Mr. W. H. White, city engineer, Town Hall, Oxford.

BOROUGH SURVEYOR'S ASSISTANTS.—March 1st.—Corporation of Stockport. £2 5s. per week, junior draughtsman, and £2 2s., two temporary draughtsmen.—Mr. John Atkinson, borough surveyor.

SURVEYOR'S ASSISTANT.—March 1st.—Seisdon Rural District Council. £65 per annum.—Mr. William Cannan, engineer and surveyor, Surveyor's Office, Wombourne, Staffs.

GENERAL FOREMAN.—March 2nd.—Teddington Urban District Council. £104—£120.—Mr. Marshall Hainsworth, surveyor, Elmfield House, Teddington.

DISTRICT SURVEYOR.—March 8th.—For the district of Rotherhithe.—Clerk, London County Council, County Hall, Spring-gardens, London, S.W.

ROAD FOREMAN.—March 8th.—Durham County Council. 30s. per week.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

SURVEYOR OF HIGHWAYS.—March 25th.—Abingdon Rural District Council. £2 10s., to a maximum of £150.—Messrs. B. & E. M. Challener, clerk, 67 Stert-street, Abingdon.

ASSISTANT.—Romford Rural District Council. £120 per annum.—Mr. W. J. Grant, surveyor, 16A South-street, Romford.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BRADFORD.—March 31st.—Designs for the replanning of Forster-square, etc.—The Town Clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

HORNSEY.—March 1st.—For the construction of a rifle range, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

KENT.—March 4th.—For the erection of a medical officer's house at the county asylum, for the Asylums Committee.—Engineer, County Asylum, Barming Heath, near Maidstone.

WORSLEY.—March 5th.—For the erection of a pump-house, for the urban district council.—Mr. J. Howard, surveyor.

TYNEMOUTH.—March 6th.—For the erection of shop, stores and offices, for the corporation.—Mr. J. F. Smillie, borough surveyor.

CORNWALL.—March 6th.—For the erection of a school, for the Education Committee.—Mr. B. C. Andrew, architect, Biddick's-court, St. Austell.

CHELMSFORD.—March 8th.—For the erection of two or four cottages, for the rural district council.—Mr. J. Dewhurst, engineer and surveyor.

NORTH DUBLIN.—March 9th.—For the erection of sixty-nine cottages, for the rural district council.—Mr. J. O'Neill, clerk.

WATFORD.—March 9th.—For the erection of two pairs of semi-detached cottages, for the rural district council.—Council Offices, 9 Market-street, Watford.

NORTHWICH.—March 10th.—For sinking a bore-hole, for the urban district council.—Messrs. J. Newton, Son & Bayley, 19 Cooper-street, Manchester.

GLOUCESTER.—March 11th.—For the erection of a pumping station and other works, for the corporation.—Messrs. Fox, Moore, Baterman & Fox, 5 Victoria-street, Westminster, S.W.

BRADFORD.—March 13th.—For the erection of a destructor, for the corporation.—City Architect.

LLANDILOFAWR.—March 15th.—For the construction of Rhydymaerdy Bridge across the river Amman, for the rural district council and the Ammanford Urban District Council.—Mr. Evan Jones, surveyor, Glancennen, Llandebie, and Mr. David Thomas, surveyor, Quay-street, Ammanford.

BOLTON-UPON-DEARNE.—March 15th.—For the erection of 293 houses and eight houses and shops, for the urban district council.—Messrs. Garside & Pennington, architects, Ropergate, Pontefract.

TREDEGAR.—March 15th.—For the erection of a caretaker's lodge at the cemetery, for the urban district council.—Mr. W. Lloyd Roach, surveyor.

HEMSWORTH.—March 20th.—For laying water mains, for the rural district council.—Mr. T. H. Richardson, engineer, Hemsworth.

NORTHAMPTON.—March 25th.—For the erection of twenty cottages, for the corporation.—Waterworks Office, Fish-street, Northampton.

Iron and Steel.

BURTON-UPON-TRENT.—March 2nd.—For the supply of pipe and specials, for the corporation.—Mr. G. T. Lynam, borough engineer and surveyor.

CHEPPING WYCOMBE.—March 6th.—For the supply of galvanised tubes, bib and stop cocks, and valve and stopcock boxes, for the corporation.—Mr. T. J. Rushbrooke, waterworks engineer, Easton-street, High Wycombe.

BURY (Lancs).—March 8th.—For structural steel and steel window frames at the generating station, for the corporation.—Mr. J. A. Settle, borough engineer, Bank-street.

PLYMOUTH.—March 9th.—For the supply of cast-iron pipes, for the corporation.—Mr. F. Howarth, city engineer.

COVENTRY.—March 15th.—For the supply of cast-iron pipes, lead pipes, solder, and hydrant and valve boxes, for the corporation.—The Water Engineer, St. Mary's Hall, Coventry.

BLACKBURN.—For the supply of iron, steel, bolts, and screws, for the corporation.—Mr. J. H. Cowell, Tramways Manager.

Roads.

EAST RETFORD.—March 1st.—For the supply of slag, granite, refined tar and Tarvia, for the rural district council.—Mr. T. Henry, surveyor.

LICHFIELD.—March 1st.—For the supply of granite, slag, tools, chippings and carting, for the rural district council.—Mr. T. Moseley, clerk.

EAST GRINSTEAD.—March 1st.—For the supply of materials, for the rural district council.—Mr. F. S. White, clerk.

CORNWALL.—March 1st.—For the supply of materials and hauling, for the county council.—Assistant County Surveyor, Clinton-road, Redruth.

UCKFIELD.—March 1st.—For the reconstruction of a road, for the urban district council.—Mr. W. H. Overton, engineer and surveyor.

SLEAFORD.—March 1st.—For the supply of 1,000 tons of broken granite, for the urban district council.—The Surveyor.

SAWBRIDGEWORTH.—March 1st.—For street watering for the ensuing season, for the urban district council.—Mr. W. Morris, clerk.

CRAMLINGTON.—March 1st.—For the supply of road material, cartage, and hire of steam roller and water cart, for the urban district council.—Mr. J. Coulson, surveyor.

DURHAM.—March 1st.—For the hire of steam rollers and steam tractor hauling plants, for the county council.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

SEVENOAKS.—March 1st.—For the supply of chert, flints, ragstone, granite, quartz, basalt, steam rolling, team labour, cartage and haulage, for the rural district council.—Mr. F. H. Vibert, clerk, Bank Chambers, 82 High-street, Sevenoaks.

HERTS.—March 1st.—For the hire of steam and petrol rollers, for the county council.—Mr. J. S. Killick, county surveyor, Hatfield.

BRIERFIELD.—March 1st.—For paving certain streets, for the urban district council.—Mr. B. Halstead, surveyor.

TONBRIDGE.—March 1st.—For the supply of rag, quartzite, and tarred macadam, for the rural district council.—Mr. F. Harris, engineer and surveyor.

BLYTH.—March 1st.—For the supply of slag, for the rural district council.—Mr. F. Hopkinson, surveyor, 81 Bridge-street, Worksop.

SEAHAM HARBOUR.—March 1st.—For the supply of road materials, for the urban district council.—Mr. F. E. Boaz, surveyor.

COCKERMOUTH.—March 1st.—For the repair of highways, for the rural district council.—Mr. S. K. Gibson, surveyor.

WEST LANCASHIRE.—March 2nd.—For the supply of granite, granite setts, tar-macadam, tar mixtures, and other road materials, for the rural district council.—Mr. A. Dickinson, clerk.

STANLEY.—March 2nd.—For the supply of whinstone, limestone, macadam, tar-macadam, broken slag and slag chippings, for the urban district council.—Mr. A. Routledge, surveyor.

MILTON.—March 2nd.—For the supply of surface-picked flints, pit flints, fine gravel, broken granite, Kentish rag, and horse labour, for the rural district council.—Mr. E. C. Pearcy, district surveyor, 45 High-street, Sittingbourne.

WOODBRIDGE.—March 2nd.—For the supply of materials, [illegible] to pass through a 2½-in. mesh and to be rejected by a 1½-in. gauge, whole chalk flint, Washmill flint, Kentish rag, and other road material, for the rural district council.—Mr. George Cook, district surveyor, Ipswich-road, Woodbridge.

CASTLE WARD.—March 2nd.—For the supply of road materials, for the rural district council.—Mr. D. Hope, surveyor, Ponteland.

WARDLE.—March 2nd.—For the supply of granite setts, for the urban district council.—Mr. J. D. Hurst, surveyor.

NEWPORT (I.W.).—March 3rd.—For the supply of road materials, for the rural district council.—Council Offices, 30 Pyle-street, Newport, I.W.

SADDLEWORTH.—March 3rd.—For the supply of road materials, for the urban district council.—Mr. E. Rowbotham, clerk.

PORTLAND.—March 3rd.—For the supply of broken granite or basalt, for the urban district council.—Mr. W. S. Lilley, [illegible].

ELLAND.—March 3rd.—For making up a certain road, for the urban district council.—Mr. P. H. Whitwam, surveyor.

POTTERSPURY.—March 3rd.—For the supply of granite and slag, for the rural district council.—Mr. J. B. Fairchild, Potterspury, Stony Stratford.

LOUGHBOROUGH.—March 3rd.—For the supply of broken granite, for the corporation.—Mr. A. H. Walker, borough surveyor.

CUDWORTH.—March 3rd.—For the supply of 1,000 tons of tarred slag, 250 tons of granite, and 500 tons of slag, for the urban district council.—Mr. W. T. Lynam, surveyor.

BINGHAM.—March 3rd.—For the supply of granite and slag, for the rural district council.—Mr. J. W. Mason, clerk.

FINCHLEY.—March 3rd.—For the supply of about 55,000 gallons of tar, for the urban district council.—Mr. C. J. Jenkin, surveyor.

GLAMORGAN.—March 3rd.—For road widening and improvement, for the county council.—County Hall, Cardiff.

COLCHESTER.—March 4th.—For the supply of road materials, for the corporation.—Mr. H. Collins, borough engineer and surveyor.

EAST BARNET.—March 4th.—For the supply of broken granite or basalt, gravel, hoggin, Portland cement, stoneware pipes, tar-paving materials, brooms, horse hire and cartage, for the urban district council.—Mr. Henry York, surveyor.

BRIDLINGTON.—March 4th.—For the supply of 3,000 tons of whinstone, for the rural district council.—Mr. [illegible], 6 Marshall avenue, Bridlington.

OXENDON.—March 5th.—For the supply of road materials, for the rural district council.—Mr. W. J.

Smith, surveyor, Rothwell House, Market Harborough.

OUNDLE.—March 5th.—For the supply of granite lay and tar-macadam, for the urban district council. Mr. G. Belson Chilvers, surveyor, St. Osyth's-lane, Oundle.

GUISBOROUGH.—March 6th.—For the supply of ordinary whinstone tarred whinstone, or heavy slag, tarred slag and concrete flag and kerbs, for the urban district council.—Mr. R. H. Kilburn, surveyor.

WILLINGTON.—March 6th.—For making up part of a certain road, for the urban district council.—Mr. J. H. Gardner, surveyor.

SELBY.—March 6th.—For the supply of road materials, for the rural district council.—Mr. J. Townend, clerk.

HUNSLET.—March 6th.—For the supply of tarred limestone, setts, manufactured flags, kerbs, Glutrin and Roemac, for the rural district council.—Mr. W. B. Pindar, clerk.

PADIHAM.—March 6th.—For the supply of road materials, for the urban district council.—Mr. J. Gregson, surveyor.

CLOWN.—March 6th.—For the supply of tarred broken slag and granite, for the rural district council.—Mr. J. T. Pears, surveyor.

CHADDERTON.—March 6th.—For the supply of setts, kerbs, concrete flags, limestone chippings, and granite setts, for the urban district council.—The Surveyor.

BELPER.—March 6th.—For the supply of granite, furnace slag, and limestone, for the rural district council.—Mr. R. C. Cordon, engineer and surveyor, Duffield, near Derby.

DRIFFIELD.—March 6th.—For the supply of flintstone, granite, broken slag, sea cobbles, sea gravel, and tarred chippings, for the rural district council.—Mr. T. Casson Beaumont, surveyor.

WINCHESTER.—March 6th.—For the supply of broken granite and chippings, and concrete paving slabs, for the corporation.—Mr. Walter V. Anderson, city engineer.

STAFFS.—March 6th.—For the supply and cartage of road materials, for the county council.—Mr. J. Moncur, county surveyor, Stafford.

NEWARK.—March 6th.—For the supply of 900 tons of granite, 1,800 tons of slag, 150 tons of tar-macadam, and 200 gallons of tar, for the rural district council.—Mr. A. J. Franks, clerk.

BINGLEY.—March 6th.—For the supply of limestone, granite and tarred materials, for the urban district council.—Mr. H. Bottomley, surveyor.

SOUTHWELL.—March 8th.—For the supply of road material, for the rural district council.—Mr. A. Edwards, highway surveyor, Edwinstowe, Newark.

FLEETWOOD.—March 8th.—For the supply of road materials, for the urban district council.—Mr. A. Cottam, clerk.

DURHAM.—March 8th.—For the supply of road materials, for the county council.—Mr. A. E. Brookes, county surveyor, Shire Hall, Durham.

LEAMINGTON.—March 8th.—For the supply of 3,000 tons of road stone, for the corporation.—Road Surveyor, Adelaide-road.

WING.—March 8th.—For the supply of 800 tons of granite, and 1,200 tons of slag, sand and gravel, for the rural district council.—Mr. M. G. Gurney, surveyor.

CHORLEY.—March 8th.—For the supply of road materials, for the rural district council.—Mr. P. Whalley, highway surveyor, High-street, Chorley.

BUCKLOW.—March 8th.—For the supply of granite setts and macadam, gritt setts and slag, for the rural district council.—Mr. R. Curtis Cordon, surveyor, Knutsford, Cheshire.

DURHAM.—March 8th.—For the hire of steam rollers and steam tractor hauling plants, for the county council. Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

FAVERSHAM.—March 9th.—For the supply of broken pit flints, shingle, and fine gravel, for the rural district council.—Mr. J. G. Chittenden, district surveyor, Ashford-road, Faversham.

UPPINGHAM.—March 9th.—For the supply of granite and screenings, for the rural district council.—Mr. F. Oakley, clerk.

RYE.—March 9th.—For the supply of materials, for the rural district council.—Mr. L. Amon, Watch Bell Chambers, Rye, Sussex.

HOYLAKE.—March 9th.—For the supply of kerbs, channels, setts, cement concrete flags and macadam, chippings, for the urban district council.—Engineer and Surveyor.

BOLLINGTON.—March 9th.—For the supply of 1,000 tons of granite setts, for the urban district council.—Mr. H. W. A. Carter, surveyor.

FOLESHILL.—March 9th.—For the supply of granite, for the rural district council.—The Surveyor.

LEWISHAM.—March 10th.—For the supply of broken granite, for the borough council.—Borough Surveyor, Town Hall, Catford, S.E.

RAINFORD.—March 10th.—For the supply of macadam, chippings and dust, tarred macadam, and tarred chippings, for the urban district council.—Mr. B. Smith, clerk.

BIRMINGHAM.—March 10th.—For the construction of Elmhurst-road, Grove Hill-road, Headingley-road, and Uplands-road (part of), Handsworth, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

HARTISMERE.—March 10th.—For the supply of 2,700 tons of 1¾-in. granite and 1,395 tons of pit stones, for the rural district council.—Mr. Harold Warnes, clerk, Eye, Suffolk.

HAYES.—March 10th.—For the supply of 8,000 gallons of refined coal tar complying with the Road Board specification, for the urban district council.—Mr. D. C. Fidler, surveyor, Council Offices, Hayes End, Middlesex.

CAISTOR.—March 12th.—For the supply of 7,100 tons of granite, 4,760 tons of slag, and 800 tons of tar-macadam, for the rural district council.—Mr. A. A. Padley, clerk.

GAINSBOROUGH.—March 13th.—For the supply of road materials, for the urban district council.—Mr. S. W. Parker, engineer and surveyor.

AYLESBURY.—March 13th.—For the supply of 2,706 tons of granite and 610 tons of slag, for the rural district council.—Mr. J. Cook, surveyor.

BILSTON.—March 15th.—For the supply and delivery of broken stone, for the urban district council.—Mr. Vincent Turner, engineer and surveyor.

WEST SUFFOLK.—March 15th.—For the supply of local stone, gravel, tools, surface tarring, and the hire of steam rollers, for the county council.—Mr. W. Lionel Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

SUTTON COLDFIELD.—March 15th.—For the supply of road materials, for the corporation.—Mr. W. A. H. Clarry, borough engineer and surveyor.

POCKLINGTON.—March 15th.—For the supply of best blue stone and rag, for the rural district council.—Mr. T. Robson, clerk.

MAIDSTONE.—March 15th.—For the supply of ragstone spalls, setts, kerbs, flints, tarred ragstone, tarred ragstone macadam, gravel and sand, for the corporation.—Mr. T. F. Bunting, borough surveyor.

HAVERHILL.—March 15th.—For the supply of broken granite, slag, and slag tar-macadam, for the urban district council.—Mr. John H. Clarke, surveyor.

HAZEL GROVE.—March 16th.—For the supply of broken stone, setts, kerbs and chippings, for the urban district council.—Mr. G. Severn Doncaster, surveyor.

CHAILEY.—March 18th.—For the supply of flints, quartzite, Kentish rag, Mendip stone, and gravel, for the rural district council.—Mr. H. Kemp Walls, district surveyor, North Common, Chailey.

KIVETON PARK.—March 20th.—For the supply of broken slag, granite and tar-macadam, for the rural district council.—Mr. F. Hewitt, surveyor.

CASTLEFORD.—March 22nd.—For works of street improvement, for the urban district council.—Mr. W. Green, surveyor.

COVENTRY.—March 22nd.—For the supply of broken road stone, granite kerbs, granite setts, stoneware pipes, castings, and workmen's tools, for the corporation.—City Engineer.

DROXFORD.—March 29th.—For the supply of 1,250 tons of granite or hard stone, for the rural district council.—Mr. J. King, surveyor, Droxford, Hants.

MID-LOTHIAN.—For the supply of refined coal tar, coal-tar pitch and pitch oil, for the county council.—Mr. Robert Moir, road surveyor, County Buildings, Edinburgh.

Sanitary.

DARTFORD.—March 1st.—For supplying and laying stoneware pipes, manholes and appurtenant works, for the rural district council. Mr. J. Hobbs, engineer, 2 Lowfield-street, Dartford.

HORNSEY.—March 1st.—For the construction of pipe sewer and manholes, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

WHITEHAVEN.—March 1st.—For the construction of sewers, manholes, flushing tanks, and outfall tank for the rural district council.—Mr. G. Boyd, 33 Queen-street, Whitehaven.

THANET.—March 1st.—For the removal of house refuse, for the rural district council.—Mr. C. Taylor, clerk, Board Room, Minster, near Ramsgate.

DRIFFIELD.—March 2nd.—For scavenging and supervising sewage disposal system, for the rural district council.—Mr. H. Botterill, clerk.

LICHFIELD.—March 3rd.—For carrying out a sewerage scheme at Watling-street, Brownhills, including the laying of 600 yds. of 9-in., and 170 yds. of 8-in. stoneware pipe sewers, and manholes, and constructing disposal works, for the rural district council.—Mr. O. Rawstron, surveyor, The Workhouse, Lichfield.

BLACKBURN.—March 3rd.—For cleansing earth-closets and cesspools, for the rural district council.—Mr. J. Birch, clerk.

CLEETHORPES.—March 4th.—For the supply of disinfectants, for the urban district council.—Mr. E. W. Turner, sanitary inspector.

NEWCASTLE-UPON-TYNE.—March 6th.—For the removal of house refuse, for the corporation.—City Engineer.

CHORLEYWOOD.—March 6th.—For the removal of refuse, for the urban district council.—Mr. W. H. Scott, surveyor.

STOKE-ON-TRENT.—March 8th.—For the supply of press cloths, lime, chemicals, coal and slack, petroleum, and lubricating oils, for the sewage department.—Sewage Engineer, Leek-road, Stoke-on-Trent.

BURRY PORT.—March 8th.—For the construction of a system of sewerage for the district of Burry Port, comprising cast-iron and stoneware pipe sewers, manholes, lampholes, flushing tanks, ventilating shafts, and other incidental works, for the urban district council.—Mr. A. P. I. Cotterell, 17 Old Queen-street, Westminster, and 28 Baldwin-street, Bristol.

MELTON MOWBRAY.—March 10th.—For the construction of a 9-in. sewer and the erection of ventilating shafts, for the rural district council.—Mr. G. E. Fryer, surveyor.

WIRRAL.—March 12th.—For the construction of sewage disposal works, for the rural district council.—Mr. W. W. Shennan, engineer and surveyor, 9 Hamilton-square, Birkenhead.

PONTYPRIDD.—March 15th.—For the supply of disinfectants, for the urban district council.—Medical Officer of Health.

THURROCK.—March 16th.—For the construction of about 4 miles of stoneware and iron sewers of 9-in., 12-in. and 15-in. diameter, together with manholes and other appurtenances, for the Thurrock, Grays and Tilbury Joint Sewerage Board.—Mr. G. Midgley Taylor, engineer, Caxton House, Westminster, S.W.

Stores.

DURHAM.—March 1st.—For the supply of broken whinstone, broken limestone, broken slag, rough slag, tarred slag, distilled and prepared tar, tools, team labour and cartage, tar-spraying, and sanitary pipes, for the county council.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

DERBY.—March 1st.—For the supply of bricks, cement, lime, disinfectants, earthenware, freestone, gritstone, granite, gravel, sand, limestone, pitch, tar, and slag, for the corporation.—Borough Surveyor.

MARYLEBONE.—March 1st.—For the supply of road materials, horses, harness and drivers, Portland cement, oils, stoneware sewers, ironwork for sewers, and slopping, for the borough council.—Mr. J. Paget Waddington, borough surveyor.

FINSBURY.—March 1st.—For the supply of brooms (scavenger and machine), castings, chandlery, disinfectants, electric fittings, granite, horse and cart hire, paints, pitch and creosote oil, Portland cement and lime, sand, ballast, stable accessories, stoneware goods, tools and general plant, wood paving blocks, York paving and patent stone, and disposal of clinker, for the borough council.—Borough Surveyor.

LICHFIELD.—March 1st.—For the supply of granite, slag, chippings, carting, tools and oil, for the rural district council.—The Surveyor, Union Workhouse, Lichfield.

NEWTON.—March 2nd.—For the supply of lime, bricks, kerbs, disinfectants, soap, earthenware pipes, granite kerbs and setts, iron castings, iron, hardware, petroleum, and Portland cement, for the corporation.—Mr. F. C. Cook, borough surveyor.

MILTON.—March 2nd.—For the supply of surface-picked flints, pit flints, fine gravel, broken granite, Kentish rag, horse labour, and Linby hard steam coal, for the rural district council.—Mr. E. C. Pearcy, surveyor, 45 High-street, Sittingbourne.

MANCHESTER.—March 6th.—For the supply of paving setts, kerbstones and flags, hard Welsh granite, pitch, tar, creosote, limestone, limestone chippings, prepared tarred granite or slag, scavenging and rotary brushes, picks and shovels, glazed stoneware and fireclay sewerage pipes, junctions, bends, gullies, gully traps, cast-iron manhole covers and steps, street grids, passage grids, galvanised iron dustbins, and cement and granite dust for making artificial flags, for the corporation.—The Surveyor, Town Hall, West Didsbury.

CHORLEY.—March 8th.—For the supply of broken granite and slag, rubble, chippings, grit setts, concrete flags, grit kerbs, earthenware pipes, pitch and oil, tools and implements, for the rural district council.—Mr. Percival Whalley, highway surveyor, Council Office.

BARNES.—March 8th.—For the supply of broken Guernsey or Alderney granite, broken pit flints and Thames ballast, disinfectants, ironmongery, Portland cement, forage and litter, granite kerb and channel, oils, paints, stoneware pipes, and horses and carts on hire, for the urban district council.—Engineer and Surveyor.

EPSOM.—March 9th.—For the supply of sewerage ironwork, gully gratings, shovels, picks, brooms, forks, dust skeps, disinfectants, Portland cement, stoneware pipes and gullies, kerbing and channelling, setts, broken granite, chippings and limestone dust, tar-paving and tar-macadam, coal and coke, hay, corn, bran, straw, bricks, paraffin, artificial stone paving, Thames ballast, Thames sand, veterinary surgeon's services, tar, pitch, and team labour, for the urban district council.—Mr. Edward R. Capon, surveyor, Bromley Hurst, Church-street, Epsom.

NEWCASTLE-UPON-TYNE.—March 11th.—For the supply of bricks, cement, clot lime, flags (artificial, freestone and Caithness), hose pipes, iron, steel, horse-shoe nails, pitch, tar, creosote oil, paints, oils, privy pans, ashbins, road stones, sanitary pipes, scavenging brooms, shovels, timber, and waterproof coats and boots, for the corporation.—City Engineer.

EAST HAM.—March 12th.—For the supply of glazed stoneware pipes, glazed stoneware gully fittings, Portland cement, grey stone, chalk and blue lias lime, lime for sewage precipitation, stock and other bricks, Thames ballast, sand, coal, coke, engineers' sundries, broken granite, crushed granite, granite setts, Guernsey and other granite chippings, granite kerb and channelling, broken flints, cast-iron work, gullies, shovels, brooms, disinfectants, oilskins, hire of horses, and carts, sewer ventilating columns, paving flags, sewer smocks, and redressing of setts, for the corporation.—Mr. C. Eustace Wilson, town clerk.

GAINSBOROUGH.—March 13th.—For the supply of broken granite or whinstone macadam, granite or whinstone setts, broken and block slag, slag chippings and dust, York setts, kerbs, channels, flags, concrete flags, stoneware and earthenware pipes, gullies, cast-iron pipes, tar-macadam, pitch and creosote oil, Portland cement and coal, for the urban district council.—Mr. S. W. Parker, engineer and surveyor.

SUTTON COLDFIELD.—March 15th.—For the supply of granite macadam and kerb, limestone macadam and setts, gravel and broken pebble stones, Yorkshire or pennant kerb, Rowley setts, earthenware pipes, cement and lime, iron castings, iron and steel, timber, hardware, oils and paints, and bass brooms, for the corporation.—Mr. W. A. H. Clarry, borough engineer and surveyor, The Council House, Sutton Coldfield.

COLNE.—March 15th.—For the supply of Lancashire and local setts, Portland cement, granite macadam, limestone macadam, lime, ironwork, team labour, kerbs and channels, pitch, creosote oil, earthenware pipes and gullies, and brushes, for the corporation.—Mr. T. H. Hartley, borough surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted

ABBEY MILLS.—For the extension of the Worthington engine-house at the pumping station, for the London County Council:

Dick, Kerr & Co., Limited, Cannon-street, E.C. ..	£6,076
A. Fasey & Sons, Leytonstone, E.	5,800
J. Ford, Harlesden, N.W.	4,427
J. Mowlem & Co., Limited, Westminster, S.W.	4,175
W. Mills & Sons, Limited, Blackheath, S.E.	4,367
Holloway Brothers (London), Limited, Lambeth, S.E.	3,850
Chief engineer's estimate, £4,000	

COCKERMOUTH.—For laying 2,600 yds. of sewer, constructing manholes, and other works, for the rural district council:

Mr. J. B. Wilson	
Johnston, Workington	£2,800
Robertson, Gretna Green	2,755
Armadale, Wakefield	2,551
Kennedy, Jarrow-on-Tyne	2,489
Thompson, Cockermouth	2,471
Fergusson & Son, Harrington	2,299

ILFORD.—Accepted for the erection of lavatory accommodation at the town hall, for the urban district council:

Mr. H. Shaw, engineer and surveyor	
W. S. Sharman, Row, E.	£462

ISLINGTON.—For the enlargement of Shelburne-road school, for the London County Council:

W. F. Blay, Limited, Cannon-street	£9,893
McCormick & Sons, Limited, Northampton-street	9,800
W. Shurmur & Sons, Limited, Upper Clapton	9,720
Rowley Brothers, Wood Green	9,680
G. E. Willis & Sons, Limited, Haymarket	9,677
Brand, Pettit & Co., West Green-road	9,440
A. Fairhead & Son, Enfield	9,417
T. D. Long, Deptford	9,329
A. Monk, Lower Edmonton	9,290
J. Willmott & Sons, Tottenham-lane	9,184
C. Miskin & Sons, Limited, St. Albans	9,074
W. J. Maddison, Canning Town* ..	9,057
Architect's estimate, £9,382.	

ST. ALBANS.—For the second section of the sewerage scheme, for the city corporation:

T. Hickman & Sons	£20,758
T. W. Pedrette	18,109
C. Miskin & Sons, Limited	17,658
G. Bell & Sons, Limited	16,853
Edwards & Co.	16,654
G. Henson & Son*	16,110

ST. PANCRAS.—For enlarging the playground of the Holmes-road school, for the London County Council:

General Building Company, St. Martin's-lane ..	£1,497
F. Pitcher, Marylebone-road	1,066
A. Monk, Lower Edmonton	925
E. A. Roome & Co., Hackney	915
Bovis, Limited, Portman-square	887
G. Godson & Sons, Kilburn-lane	885
W. F. Blay, Limited, Cannon-street	847
Triggs & Co., Clapham	837
McCormick & Sons, Limited, Essex-road	830
Brand, Pettit & Co., West Green-road	795
H. & E. Lea, Regent-street	793
F. Bull, Upper Clapton	791
Marchant, Hirst & Co., Highgate-road	776
Stevens & Sons, Crouch Hill*	748
Architect's estimate, £835.	

WANDSWORTH.—For making up Gamlen-road, Putney, for the borough council:—Mr. P. Dodd, borough surveyor.

E. Parry & Co., £414 and schedule prices for extras or omissions.‡

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MARCH.

3.—Institute of Sanitary Engineers: Mr. G. Bertram Kershaw, M.AM.SOC.C.E., M.INST.C.E., on "Sanitation in the Bermudas: The Drainage of Hamilton, Bermuda." Caxton Hall, Westminster. 8 p.m.

4.—Concrete Institute: Mr. R. Graham Keevill, A.M.I.MECH.E., on "Wind Pressure." Denison House, Vauxhall Bridge-road, S.W.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SEISDON RURAL DISTRICT COUNCIL.
SURVEYOR'S ASSISTANT.

Applications are invited for the appointment of Temporary Assistant in the Engineer and Surveyor's Department.

Applicants must be good Draughtsmen, with a good knowledge of Surveying, Levelling, Building and Drainage Inspection, and the general work of a Surveyor's Office. Salary at the rate of £65 per annum, with bicycle.

Applications, in candidate's own handwriting, endorsed "Surveyor's Assistant," stating age and experience, and enclosing copies of not more than three recent testimonials, and giving the date on which the applicant can take up his duties, must be received by me not later than Monday, the 1st March, 1915.

WILLIAM CANNAN,
Engineer and Surveyor.

Surveyor's Office,
Wombourne.
February 12, 1915. (2,369)

URBAN DISTRICT COUNCIL OF TEDDINGTON.
APPOINTMENT OF GENERAL FOREMAN.

The Council invite applications for the appointment of General Foreman.

Applicants must be between 30 and 45 years of age. Practical experience is essential in the construction and maintenance of roads, sewers, paving, and other Municipal works, the keeping of the necessary wages and stores books. The duties will also include the supervision of the Council's horses.

Salary £104 per annum, rising by annual increments of £4 to a maximum of £120, the appointment to be subject to one month's notice on either side.

The person appointed will be required to reside at the Council Offices and act as Caretaker; an extra allowance of 5s. per week will be paid for cleaning offices, [illegible] and gas.

No application will be considered unless made upon a Form to be obtained from Mr. Marshall Hainsworth, Surveyor, Elmfield House, Teddington, to be accompanied by not more than three copies of [illegible] must be received by the undersigned not later than noon on Tuesday, the 2nd March, 1915.

Canvassing, directly or indirectly, any Councillor or [illegible] disqualification.

(By order)
G. H. SALMONS
Clerk.

Council House,
Teddington.
February 15, 1915. (2,380)

COUNTY BOROUGH OF STOCKPORT
BOROUGH SURVEYOR'S ASSISTANTS.

The Highways and Sewerage Committee are prepared to receive applications for the appointment of a Junior Draughtsman, salary £2 5s. per week, and two Temporary Draughtsmen at £2 2s. per week.

Applicants for the position of "Junior Draughtsman" must state whether they are willing to accept the temporary positions.

Applications, in candidate's own handwriting, stating age, qualifications and experience in the routine of a Borough Surveyor's Office, accompanied by copies of two recent testimonials, to be delivered to the undersigned before Monday, the 1st March, 1915, endorsed "Junior Draughtsman" and "Temporary Draughtsman."

JOHN ATKINSON, A.M.INST.C.E.,
Borough Surveyor.

Town Hall, Stockport.
February 15, 1915. (2,377)

COUNTY COUNCIL OF NOTTS.
APPOINTMENT OF COUNTY SURVEYOR.

The County Council of Notts are desirous of receiving applications for the office of County Surveyor. The person appointed will be required to reside in or near to the Town of Nottingham, and to devote the whole of his time to the discharge of the duties of the office. He will not be allowed to engage in any private practice.

The salary will be £750 per annum, and, in addition, travelling expenses will be paid.

Applications, marked "County Surveyor," with copies of not more than three recent testimonials, must be made upon Forms which will be forwarded by me upon receipt of an addressed foolscap envelope.

The applications must reach me not later than midday on Saturday, the 27th day of February, 1915.

Canvassing is strictly prohibited, and will be deemed a disqualification.

(By order)
H. HAMPTON COPNALL,
Clerk of the County Council.

Shire Hall,
Nottingham.
February, 1915. (2,304)

COUNTY OF DURHAM.

APPOINTMENT OF ROAD FOREMAN.

The County Council of Durham invite applications for the position of Road Foreman in the Auckland and Chester Main Road District.

Applicants must have had practical experience in the construction and repair of paved and macadamised roads, in the supervision of manual and team labour, and in keeping time and materials accounts.

He will be required to work the same hours as the workmen, and to reside at an approved centre within the district.

The commencing wages will be 50s. per week, with an allowance of 3s. per week for use of a bicycle.

Applications, in candidate's own handwriting, giving full particulars of previous experience, stating age, and accompanied by not more than three recent testimonials, to be sent to the undersigned not later than 8th March, 1915.

ALBERT E. BROOKES,
County Surveyor.

Shire Hall,
Durham.
February 10, 1915. (2,383)

APPOINTMENTS WANTED.

GENTLEMAN, well known in Government, Municipal and Contracting circles, is desirous of Agency. Has own office in Westminster.—Box 1,507, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

PUPIL WANTED.

THE SURVEYOR to a Rural District Council in the Midlands is prepared to take a Pupil in his office, where a good general experience—water supply, sewerage, and road construction—could be obtained.

Moderate premium. Apply Box No. 1,504, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,359)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BILSTON URBAN DISTRICT COUNCIL.

TO GRANITE MERCHANTS.

The above Council is prepared to receive Tenders for the Supply and Delivery of Broken Stone for the year ending 31st March, 1916.

Specification and Form of Tender may be obtained upon application to the undersigned, which must be returned, duly filled in, sealed, and endorsed "Tender for Stone," not later than 9 o'clock on Monday, the 15th March, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

VINCENT TURNER, ASSOC.M.INST.C.E.,
Engineer and Surveyor.

Town Hall, Bilston.
February 24, 1915. (2,398)

EAST BARNET VALLEY URBAN DISTRICT COUNCIL.

The East Barnet Valley Urban District Council is prepared to receive Tenders for the supply of the undermentioned for one year ending March 13, 1916:—

Broken Granite or Basalt for Roadways.
Gravel, Hoggin, &c., for Roadways.
Portland Cement.
Stoneware Pipes.
Tar-paving Materials.
Brooms.
Horse Hire and Cartage.

Specifications and Forms of Tender can be obtained on application to Mr. Henry York, C.E., Surveyor to the Council.

Tenders must be on the Forms supplied, and delivered at the Council's Offices, addressed to the Chairman of the Council, not later than 12 noon on Thursday, the 4th March, 1915.

Samples of Materials must be deposited with the Tenders.

The Contractor or Contractors will be required to pay the local rate of wages prevailing in the district for the same class of work for which his or their Tender is accepted.

The Council do not bind themselves to accept the lowest or any Tender.

T. A. BUCKLEY,
Clerk.

Offices of the Council,
Station-road, New Barnet.
February 23, 1915. (2,405)

EAST HAM CORPORATION.

ANNUAL SUPPLIES.

The East Ham Corporation invite Tenders for the aftermentioned Supplies, and for Executing the following Work, for—

(1) A period of 6 months, ending 30th September, 1915, and, alternatively,
(2) A period of 12 months, ending 31st March, 1916.

Glazed Stoneware Pipes.
Glazed Stoneware Gully Fittings (London Make).
Portland Cement.
Grey Stone, Chalk and Blue Lias Lime.
Lime for Sewage Precipitation.
Stock and other Bricks, &c.
Thames Ballast, Sand, &c.
Coal and Coke.
Engineer's Sundries (Oils, Colours, Painters' Brushes, Ironmongery, &c., for Borough Engineer's Department).
Engineer's Sundries (Ironmongery, Painters' Requisites, Brushes, &c., for Electric Lighting and Tramways Department).
Broken Granite.
Crushed Granite.
Granite Setts.
Guernsey and other Granite Chippings.
Granite Kerb and Channelling.
Broken Flints.
Cast-iron Work, Gullies, &c.
Shovels, Brooms, Picks and Handles.
Disinfectants.
Oilskins.
Hire of Horses and Carts for Watering Streets.
Hire of Horses and Carts for General Cartages.
Hire of Horses and Carts for Scavenging.
Hire of Horses and Carts for Collection of House Refuse.
Cartage of Lime.
Uniforms for Firemen, &c.
Uniforms for Tramway Employees.
Sewer Ventilating Columns.
Paving Flags.
Boots, Sewer Smocks, &c.
Veterinary Attendance on and Shoeing Horses.
Provender.
Reglazing and Repair of Street Lamps.
Jarrah Wood Blocks.
Receiving, Sorting and Levelling Refuse at Destructor Works.
Removal of Tinware from Destructor Works.
Redressing of Setts (Labour only).
Drugs, Medicines and Chemists' Sundries.
Window Cleaning.
Cleaning Eaves-gutters.

Particulars and Forms of Tender may be obtained upon application at the Office of the undersigned, or by forwarding an addressed cover (foolscap size), duly stamped.

The person or persons whose Tender is accepted will be required to observe and fulfil the obligations upon Contractors specified in the Fair Wages Resolution adopted by the House of Commons on the 10th March, 1909, which is fully set forth in the Form of Tender, and to enter into a Contract with a bond for the due performance thereof.

Tenders to be delivered addressed to His Worship the Mayor, Town Hall, East Ham, E., and endorsed according to the supply or work tendered for, not later than 12 o'clock noon of Friday, the 12th day of March, 1915.

The Corporation does not bind itself to accept the lowest or any Tender.

(By order)
C. EUSTACE WILSON,
Town Clerk.

Town Hall,
East Ham, E.
February 22, 1915. (2,403)

BOROUGH OF COLNE.

The Highways and Streets Committee of the Borough of Colne are prepared to receive Tenders for the Supply and Delivery during the twelve months ending the March, 1916.

Lancashire
Setts.
Portland Cement. Pitch.
Granite Macadam. Creosote Oil.
Limestone
Lime. Gullies.
Ironwork
Metal
hole Covers).

Specification and Forms of Tender and other information may be obtained on application at the Office of the Borough Surveyor, Mr. T. H. Hartley, and Tenders addressed to the Chairman of the Highways and Streets Committee, properly endorsed, must be delivered at the Office not later than March 15th, 1915.

The Committee do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to deal with each item separately.

(By order)
ALFRED VARLEY

Town Hall, Colne,
Lancs.
February 22, 1915.

MIDLOTHIAN COUNTY COUNCIL.

Tenders are invited for the supply of Refined Coal Tar, Coal-tar Pitch, and Pitch Oil, for the year 1915.

Schedules of Quantities and Conditions of Contract may be obtained from the Subscribed

ROBERT MOIR,
County Road Surveyor.

County Buildings,
Edinburgh

Calno
Reg.d

THE ONLY FIRE-RESISTING FIBRE
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MADE IN
GREAT BRITAIN

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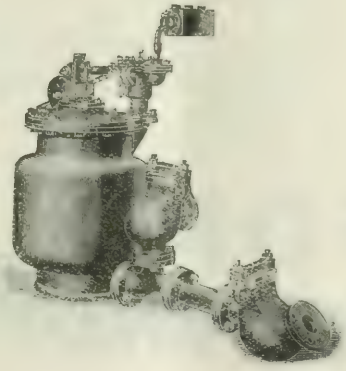

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ASHTON-IN-MAKERFIELD, Lancs.
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Telegraphic Address: "HEAT, STOURBRIDGE." Telephone: No. 10.

HAYES URBAN DISTRICT COUNCIL.

COAL TAR.

Tenders are invited for the year ending March 31st, 1916, for the supply of 8,000 gallons (more or less) of Refined Coal Tar, complying with the Road Board Specification.

Tar to be delivered in Barrels, as required, at Hayes and Harlington Station (G.W.R.), or delivered by motor lorry in the Urban District of Hayes.

Tenders, endorsed "Tar," to be delivered at the Council Offices, Hayes End, Middlesex, on or before noon of Wednesday, March 10th, 1915.

D. C. FIDLER,
Surveyor.

Council Offices,
Hayes End, Middlesex.
February 23, 1915. (2,407)

AMENDED ADVERTISEMENT

CITY OF BRADFORD.

The Corporation are prepared to receive Tenders and Schemes for the work required in Erection of New Destructor, Boilers, and Setting at the Sunbridge-road Destructor Works, and for the removal of the Old Destructor, Boilers, and other accessories.

General Conditions of Contract may be seen, and Specification, Drawings, and Form of Tender obtained, on application to the City Architect, Town Hall, Bradford.

The Contract will be [illegible] subject to the Fair Contracts Clauses of the Corporation.

Sealed and endorsed Tenders must reach me not later than 9 a.m. on Saturday, 13th March, 1915.

The lowest or any Tender will not necessarily be accepted.

FREDERICK STEVENS, Town Clerk.
Town Hall, Bradford. February 18, 1915. (2,397)

HARTISMERE RURAL DISTRICT COUNCIL.

GRANITE AND PIT STONES.

The above-named Council invite Tenders for the supply of about 2,700 tons of 1¾-in. Granite, and 1,395 tons of Pit Stones, to be delivered as required at the following Stations: Diss, Eye, Finningham, and Mellis on the Great Eastern Railway; Aspall, Mendlesham, and Brockford on the Mid-Suffolk Light Railway. Samples of Materials to be sent, carriage paid, to the Master of the Workhouse, Eye. Tenders to be sent to the undersigned not later than Wednesday, the 10th March, 1915. No Form of Tender is issued. The Council do not bind themselves to accept the lowest or any Tender.

HAROLD WARNES, Solicitor,
Clerk to the Council.

Eye, Suffolk.
February 23, 1915. (2,404)

WASHING & SCREENING MACHINERY

For Clinker and Other Media.

Hand or Power Drive

Washing and Grading in One Operation.

Patent No. 2133 of 1913.

THE GRANULE MACHINERY CO., LTD.,
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CROWTHORNE, BERKS.

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DARTFORD, KENT.

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. MARCH 5, 1915. No. 1,207.

Minutes of Proceedings.

"Misfeasance" by Road Authorities.

With further reference to the decision in the case of *Warren* v. *Devon County Council and Fothergill Brothers*, briefly commented upon at p. 285 *ante* it will, we think, be of interest to consider the general question of the distinction between nonfeasance and misfeasance in the light of one or two reported cases. The dividing line is, as will be seen, a very narrow one. In the first case we shall notice (*Shoreditch Corporation* v. *Bull*, 68 J. P., 415) the corporation filled the double *rôle* of highway authority and sanitary authority, though apparently this was not material to the decision. After having repaired in a certain road they filled in the trench and opened the road for traffic. About a week afterwards a cab was being driven along the road when the driver, finding the soil where the trench had been filled in to be soft and unsafe, crossed to the offside. Avoiding Scylla he fell into Charybdis—represented by a heap of rubbish—the cab was overturned, and the fare (the plaintiff in the action) sustained serious injuries. The corporation were not responsible for the presence of the rubbish (which had been deposited without their authority), but they knew it was there. The jury found that, at the time of the accident, the part of the road that had been filled in was dangerous for traffic. The case was fought right up to the House of Lords, where it was held that the throwing open of the road when it was not fit for traffic amounted to misfeasance, for which the corporation were liable. It is not such a very "long way" to the next case (*Ryan* v. *Tipperary County Council*, 1912, 2 I.R., 392). This was an instance of a road being under repair, the usual course having been taken of repairing one longitudinal half at a time, leaving the other half open for traffic. The plaintiff, driving along this open half, collided with a large stone lying close to the grass margin, opposite to a steam roller. It was suggested that he had been guilty of "contributory negligence" in not using proper care and caution. But the jury negatived this suggestion, and found that the council were guilty of negligence in not having removed the stone which caused the accident, and the Court held that such negligence amounted in law to misfeasance. In another Irish case (*Breen* v. *Tyrone County Council*, 42 I. L. T. 250) the repairing of the planking of a bridge with a defective board, resulting in injury to a horse, was held to amount to misfeasance. In *Torrance* v. *Ilford Urban District Council* (73 J. P., 225) the council were held guilty of misfeasance in laying a deep layer of broken stone across the whole width of the road for a considerable distance, instead of rolling it as the work proceeded. And in *Meeling* v. *St. Mary Newington Vestry* (10 T. L. R., 54) the filling up of a hole in a road with improper material, apparently, but not really, solid, was considered to amount to misfeasance.

These cases are all connected with the repair of roads. In *Maclennan* v. *Manchester Corporation* (1912, 1 K.B., 118) the facts were of a somewhat different order. Many years ago a road terminating in a ravine was laid out and dedicated to the public. In 1903 the corporation made this road up as a street, and lighted it—after a fashion—but they took no steps to fence off or otherwise to protect the public from the ravine, or to place a watchman or lights near the spot. On the opposite side of the ravine was another street running in the same direction as the street in question, and at night the lights in the two streets, being in line, lured the unwary into the belief that there was one continuous street. The plaintiff, driving at night along the street, was precipitated into the ravine, with serious results. Here also contributory negligence on the plaintiff's part was alleged, but negatived by the jury, who, moreover, found that the street was dangerous; that the unfenced ravine was a trap; and that when the corporation made up the street they took no sufficient care to warn the public of the danger, but invited them to pass along the street as if it was continuous with the street on the opposite side of the ravine. It was held that, although when a road is dedicated as a highway the public take it with all its defects, if the road authority undertake to deal with regard to it and make it up, they must exercise due care and have regard to the safety of those who will use it; that the omission to fence the ravine amounted to misfeasance; and further that, having undertaken to light the street, and having done so negligently and inadequately, they were liable on this ground also. Of course, it is to be borne in mind that

negligence is a necessary ingredient in misfeasance. In the cases noted that element was present. But as an instance of the contrary we may refer to *Holloway* v. *Birmingham Corporation* (69 J.P., 358), which, like the Devon case, was concerned with a tarred road. But in this instance the accusation was that the corporation had allowed the tar to remain without renewal for an unreasonable length of time, as a result of which the road became uneven and dangerous. The actual cause of the accident was a pool of tar which, in consequence of hot weather, had oozed up between the setts, and on which the plaintiff's mare slipped. But there was no evidence that the road had been improperly constructed, and in the absence of any such evidence it was held that there had been no misfeasance on the part of the corporation. The facts in the Devon case were, of course, altogether different, but, as we understand an appeal is possible, we defer any further comment.

* * *

Rural Housing. The difficulty which has always existed of providing cottages in rural districts which can be let at economic rents has been intensified during the last few months. The increase in the rate of interest at which money can be borrowed is in itself a very serious item, but when it is considered in conjunction with the rise in the price of building materials, the production of a self-supporting rural housing scheme will be seen to be virtually impossible at the present moment. These points were emphasised by a deputation from the Rural District Councils Association which recently waited upon the President of the Local Government Board. In the course of his reply, Mr. Samuel dissented from the suggestion that economic building was impossible because of the low wage received by the agricultural labourer, pointing out that there are other classes of people in the village—postmen, policemen, railwaymen, carpenters, blacksmiths and others—who very often will be willing, for a new and comparatively roomy cottage, with perhaps a ¼ acre of land, to pay a very much higher rent than the agricultural labourers, who in their turn can occupy the cottages thus vacated. The deputation asked for a definite pronouncement as to the views of the Local Government Board as to whether, having regard to the present crisis, schemes in hand should be proceeded with or additional schemes prepared as they seem to be required. This request was answered in a letter from the Board which was subsequently addressed to the association, and, as might have been expected, the Board found it impossible to lay down any rules which would be universally applicable. The following principles may, however, be stated in the words of the letter itself:—

> In many cases in which the President considers that a necessity for the erection of new houses for the working classes has been shown to have arisen, he would be content that the actual erection of houses should be postponed if the councils concerned showed their earnest desire to meet the situation when the circumstances became more favourable either as regards the rate of interest or the cost of building, by obtaining approval at once of plans which could and would then be carried out.
>
> In other cases where the need for houses is very acute and particularly where this need is urged as a reason for not taking steps for dealing with existing insanitary houses, the position is somewhat different, as the council concerned cannot be allowed to neglect their statutory duties under the Housing Act in this respect.
>
> Again, as regards the cases in which there have been complaints under sec. 16 of the Housing, Town Planning, &c., Act, 1909, which have been or are found to be justified, the President would feel much difficulty in allowing postponement of action unless the circumstances were very exceptional.

This general statement will at least be useful as a guide to those authorities who are desirous of not shirking their duty on the one hand, nor embarrassing the Government by raising unnecessary loans on the other.

* * *

Rural Cottage Design. It may be within the recollection of our readers that towards the end of 1913 an Advisory Committee was appointed by the President of the Board of Agriculture to consider and advise upon plans, models, specifications, and methods of construction for rural cottages and outbuildings. The report of this committee is now on sale, and will be found to be of the greatest interest and practical usefulness to all who may be interested in rural cottage design. It contains illustrations of twenty-three types of cottages for rural labourers, with notes as to the suitability of each type to particular circumstances of site, aspect, materials, and so on. Four designs are for single cottages (including two bungalows), thirteen are for pairs, and six for blocks of four. The accommodation provided includes a living-room, scullery, larder, and three bedrooms. In two instances (in addition to the bungalows) the third bedroom is on the ground floor, and might be used alternatively as a parlour; while in two other cases a parlour is provided in addition to the accommodation already mentioned. Ten of the designs represent a selection made by the committee from the prize-winning designs in the cottage planning competition organised by *Country Life*. Of the remaining thirteen, the majority were specially prepared for the committee. The text of the report includes chapters —among others—on the requirements of the rural labourer, the design and structure of the cottage, drainage, and water supply. A standard specification is printed in an appendix. The designs from which the illustrations in the report are reduced may also be obtained on a quarter scale on separate sheets, and inasmuch as these represent the best work which has been done in rural cottage design up to the present, they should have a wide circulation and be a source of suggestion to those who are responsible for the actual work of design for any particular case.

* *

An Engineers' Unit. As many of our readers are doubtless aware, the City of London National Guard is rapidly developing under the able direction of the commandant, Colonel G. T. B. Cobbett, V.D., into an exceedingly well-organised force, which will be capable of rendering valuable service whenever called upon by His Majesty's Government to take part in the duty of defending the country, and particularly the City of London, or to undertake duties at present being performed by Regular and Territorial Forces which could be employed more advantageously at the Front. Consisting exclusively of men over forty years of age, and including more than 2,500 members, the National Guard is one among many other noteworthy demonstrations of the patriotic feelings entertained by all classes of the community. With the object of further increasing the scope and practical value of the Guard, it has been decided to form in connection with it a corps of engineers, comprising members of all branches of the engineering profession. We understand that some of the leading engineering institutions have already expressed their readiness to co-operate in the formation of the new corps, which will probably be divided into units, each composed of professional men specially qualified for dealing with classes of work coming under the general heads of

civil, mechanical, electrical, and sanitary engineering.

As it is proposed that all members shall be skilled engineers, the "individual technical training" undergone by ordinary Royal Engineer recruits would obviously be superfluous, and the first duty of the corps will be to become efficient by means of "collective training" in ordinary military routine, so as to make the body capable of working either alone or in conjunction with the main corps in field manœuvres. When efficient in infantry and musketry drill, the various sections of the company will be afforded opportunities of learning and becoming familiar with the manner in which the technical experience of members can be most advantageously utilised in military operations. It is announced that the command of the Engineers' Unit will be taken by Colonel C. E. Cassal, V.D., F.I.C., F.C.S., F.R.SAN.I., late Commanding Officer of the London Brigade Royal Garrison Artillery, Territorial Force, and late Commanding Officer of the 1st London Field Engineers (Vols.). The Engineers' Unit are certainly to be congratulated on the fact that they have been able to secure a commanding officer of exceptional experience. Further particulars and application forms for membership can be obtained from the Adjutant, the City of London National Guard Volunteer Corps, 99 Gresham-street, E.C. We have no doubt that the corps of engineers will appeal strongly to professional men who, although beyond the age for service in His Majesty's Army, are willing to place their technical knowledge and experience at the disposal of the country, and who would naturally prefer to be employed as engineers rather than as riflemen.

* * *

Accurate Estimating.

A deputation from the Institute of Builders, which recently waited upon the council of the Surveyors' Institution, has led to the preparation by the latter body, in consultation with the council of the Society of Architects, of a most useful memorandum on the question of estimating for attendance on sub-contractors. In this memorandum it is pointed out that the practice of quantity surveyors in leaving the cutting away and attendance on sub-contractors to be priced in a lump sum by the principal contractor forms a formidable obstacle to accurate estimating, particularly in the case of large works. The preparation of reliable estimates is of advantage alike to the building owner and contractor, and the suggestions embodied in the memorandum are therefore worthy of very careful consideration. Two main points are dealt with. In the first place greater certainty is aimed at by laying down a definition of the term "attendance," by which it does not comprise any works of construction—*e.g.*, pipe trenches, castings, and so forth—but does comprise all cutting away and making good after, receiving materials and providing storage space for them, providing water, and allowing the use of erected scaffolding and fixed plant. As regards the provision of special scaffolding, where required, there was some difference of opinion, the council of the Surveyors' Institution holding that this does not come within "attendance," but should be the subject of a separate item in the bill. The second point dealt with in the memorandum was that, instead of "attendance" being priced in one lump sum, there should be given as much in detail as possible the extent of the work which it is proposed the sub-contractor shall do, stating precisely what services will have to be rendered to him. Of course, these details would be followed by a general item allowing for any further expense of "attendance" beyond the items priced separately. We imagine that there will be something like general agreement in regard to both these proposals, and all concerned in the preparation of the memorandum are to be congratulated upon a distinct step towards the goal of accurate estimating.

* * *

An Important Judgment.

The recent judgment of the House of Lords in the case of *The Worcester Corporation v. The Stourbridge Navigation Company and Gloucester and Birmingham Navigation Company* decided an important question in regard to the liability for the repair of bridges carrying a highway over a canal. The Court of Appeal decided that a local Act of 1791, which provided that all bridges required to carry a highway over the canal in question, now owned by the appellant company, should from time to time be supported, maintained, and kept in sufficient repair by the canal company or their successors, created an obligation to maintain and keep in repair such bridges according to the standard of the traffic requirements of the present day. Against this decision the canal company successfully appealed, and the importance of the case may be judged from the fact that the bridges in dispute will have to be reconstructed if they are to bear modern traffic. The question for decision, therefore, was whether the local Act imposed an obligation to reconstruct the bridges from time to time so as to bear traffic which, though ordinary, is progressively including heavier vehicles. To this question the house replied with a unanimous negative. The Lord Chancellor observed that what the statute required the company to keep in sufficient repair was "such bridges as were approved by the commissioners," and that this did not amount to an obligation to reconstruct so as to provide bridges of a standard higher than that which the commissioners had prescribed. The decision was based upon the express provisions of the statute, and appears to conflict with other similar cases in which it has been said in effect that where undertakers interfere with a highway they have a perpetual liability cast upon them to maintain a bridge or other construction for the purpose of preserving intact the public rights.

Surveyors and Articled Pupils.

In another column will be found some account of a discussion which took place at the last meeting of the Earby (Yorks) Urban District Council upon a recommendation of the Finance Committee that the surveyor should be authorised to take a pupil into his office at a premium to be arranged between himself and the pupil, and to be spread over a period of three years. The discussion arose on a rather curious amendment based upon a contention that equal facility should be given for every parent in the district who had an eligible son for the vacancy. Such a suggestion apparently involves the payment of the premium out of the rates as a sort of scholarship, and the amendment was discussed on these lines. The idea is a novel one, and for our part we are unable to see any valid reason for its adoption. The pupil who is articled to a surveyor in practice is soon able to be of some service to his master, and in fixing the premium and the amount of pocket-money to be allowed some value is placed on this service. In the case, however, of the lad who is articled in a municipal office, this service is rendered for the benefit of the local authority, who in most cases pay nothing for it. The premium is paid for the instruction received from the master, and in our view its amount concerns only the two immediate parties. We can see no reason why it should be paid by the ratepayers or received by the local authority on their behalf.

D

The Treatment of Waste Waters from China-clay Works, Quarries and Coal Washing.—(VI.)

By G. BERTRAM KERSHAW, M.Am.Soc.C.E., M.Inst.C.E., Late Engineer to the Royal Commission on Sewage Disposal.

The working of china clay, or "Kaolin," is confined in this country to the counties of Cornwall and Devonshire, St. Austell, in Cornwall, being the chief centre, and the water of the streams and rivers adjoining the clay works is often milky white from the clay water reaching them.

China clay is used for many purposes other than the making of china—*e.g.*, for weighting cotton goods, mixing with paper-making pulp, &c.

The waste waters from china clay works are not poisonous to cattle, but they are injurious to fish-life by reason of the clogging caused to the gill fringes of the fish; moreover, the suspended matter in the waste waters, apart from the unpleasant appearance which they impart to river water, exercise a silting-up influence, and in times of flood deposits of clay are often washed over pasture land used for cattle.

The clay is usually obtained from pits, by baring down to the clay; when this is reached a sump is formed, and the clay washed into it by jets of water. The coarser material, such as quartz and dirt generally, settles to the bottom of this sump, while the finer clay is pumped up to tanks for settlement. The liquid pumped resembles rather thick milk. After settlement has taken place in the tanks, the clay is removed from the tanks and dried artificially in cubes about 8 in. square, while the supernatant tank liquor is either re-used in the pit or run into the stream, as the case may be.

The waste liquor derived from the process of settlement is usually the colour of milky water, this appearance being entirely due to infinitely small particles of clay held in suspension.

This suspended matter often amounts to upwards of 100 parts per 100,000 in a settled liquor, and it takes a very long time to deposit by unaided settlement, a bottle filled with the liquid remaining milky for weeks, unless salt or acid is added to assist deposition.

As a rule, all that is done to remove the suspended matter is to give simple settlement in rather primitive tanks, formed by embankment in the valleys. These tanks are seldom cleaned out, until they become nearly full of deposited matter, the usual course adopted being to add to the height of the embankments, so as to increase the tank capacity.

It must be borne in mind in considering the pollution—or rather the discoloration and silting-up effect—caused by china-clay waste liquids, that most of the rivers and streams into which the wastes are poured are comparatively short and unimportant, and it is questionable whether any process other than simple settlement could be demanded; and in certain cases, where there are no fishing rights, it seems doubtful whether even settlement need be used. Such a river as the "Red" River has never held fish for generations, and it would appear that purification in such cases would not merely be unnecessary, but an absolute waste of money. As a rule, settlement would be fairly easy for most of the works concerned, and this process could generally be carried out without seriously hurting the industry. If, however, the suspended matter required reducing down to, say, 4 to 5 parts per 100,000, the use of chemicals would be needed, and this would be a most serious matter for the owners and shareholders of the mines.

Regarding the difficulty of settling the very fine suspended matter, the 1868 Commission remark (Fifth Report, Vol. I.): "Of 100 parts of suspended matter contained in the white waste water flowing from a clay pit at St. Austell, 11·56 parts were deposited in the first quarter of an hour, and 47·68 parts in the next six hours, leaving 40·76 parts still in suspension. Here, again, the turbid water had been submitted in various clay pits to prolonged subsidence, and the sample operated upon contained only 47·44 parts of suspended matter in 100,000 parts of water."

Again—"A much less favourable result was obtained in the experimental subsidence of the muddy water discharged from the Gazelan clay works. Although this waste discharge contained as much as 251·6 parts of suspended clay in 100,000 parts of water, it deposited only 2·8 per cent in the first quarter of an hour, and 32·3 per cent in the next six hours, leaving no less than 64·89 per cent still in suspension."

From this it will be seen that to obtain a clear liquid by simple sedimentation is a matter of some considerable difficulty.

QUARRIES.

Refuse waters from quarries are somewhat frequently met with in the Midlands and in the North of England, and what has been already said with regard to the treatment of china-clay water applies equally to waste waters derived from quarries. In the case of quarries, the waste liquids are frequently discharged into fishing rivers or canals, where a large quantity of suspended matter, even though inorganic, would be inadmissible.

As a rule, the smaller-sized stone from quarries is washed after crushing and before grading to size. The washing is often effected in an inclined trough provided with automatic moving spatulas, which work the crushed material up and down in the trough, the washed stone finally falling into a tip-wagon. Water plays on the material as it moves in the trough, washing away the particles of clay, &c., adhering to the stone. In the quartzite quarries in Warwickshire a good deal of red-ochre coloured matter sometimes occurs in the quarries, discolouring the water. Generally speaking, the waste waters from quarries is not very large in volume, and much of the coarser suspended solids can be settled out by careful tank treatment, since most of the particles in the waste water are very much coarser than those derived from china-clay works. Still, even when the coarser matter has been settled out, there still remains much finely divided matter, and this takes some considerable time to settle with unaided subsidence. Quiescent settlement, as would be expected, gives better results—other things being equal—than continuous flow sedimentation.

Stone polishing and sawing yield very similar waste waters to those turned out by quarries. The particles carried off by the water during stone polishing are very fine, since hard stones are operated upon, and it is difficult to settle them in a reasonable time without resorting to the use of chemicals. At the Grinshill quarries, with which the writer was connected many years ago, both red and white freestone was quarried, and most of it was sawn and worked up at the quarries. The saws employed were steel blades set in a frame which moved backwards and forwards over the stone to be cut. The cutting was carried out by means of minute steel shot—about the size of dust shot—which were placed under the steel blades. A small stream of water played above each blade. At these quarries the waste waters, charged with silt, were conveyed to small embanked ponds, and on Monday mornings, before commencing work, the top water was drawn off, and some of the settled silt removed. The silt in the semi-dry state was found to form an excellent polish for iron or brass work. When the ponds became too full of material, this was dug out and disposed of on old spoil heaps. The quantity of water used it may be noted, did not exceed about 1,000 gallons per day.

In the case of deep quarries where the limit of depth has been reached, waste liquors can, of course, be run direct into the quarry, and the water re-used after settlement. There is, however, naturally a limit to this procedure, and in some cases it may be necessary to pump the water and silt to special tanks placed above the quarry.

It should be borne in mind throughout that waste waters from the four industries above mentioned are, in nine cases out of ten, objectionable solely by reason of the suspended matter which they carry, and not by reason of any impurities held in solution.

COAL WASHING.

This process is carried on at practically all collieries, and consists in subjecting the smaller coal to the action of running water, which removes such foreign matters as clay, shale, pyrites, &c. The larger coal

is generally roughly hand picked to remove shale, &c.

The quantity of dirt which the coal contains depends very much upon the thickness of the seams and the absence or presence of clayey matter.

There are a number of special machines on the market designed to wash small coal, such as the Baum, Elliot, Blackett, Greaves, and many others.

In the Greaves washer foreign matter is separated from the coal by a perforated tray moving backwards and forwards under water, the motion given to the tray being much the same as that used in the sifting mechanism of a threshing machine drum part.

In most of the other coal-washers the tray containing the coal is fixed, while the water moves up and down, the fine dirt, which is heavier than the coal, issuing from the bottom of the machine, while the washed coal comes away at the top.

The wash water coming away from the machines is very turbid and black in appearance, and it contains very large quantities of fine coal dust and other substances in suspension—very frequently more than 5,000 parts per 100,000—while the water is very often acid in reaction. A rather large volume of water is used in washing coal, often exceeding 1,000 gallons per ton of coal washed. In many instances, where the wash waters are settled in ponds or tanks, it is re-used over and over again, with benefit both to the streams and to the colliery proprietors.

The continued discharge of crude coal wash waters into rivers and streams of small volume renders the stream water quite unfit for domestic purposes, while it destroys fish and silts up the bed of the stream. Again, as in the case of china-clay wastes, when floods occur silt is often washed over pasture-land to its detriment.

The method of treatment adopted at various collieries throughout the country varies considerably, while in some districts—as, for example, in South Wales—little or nothing is done by way of treatment before the waste waters are discharged. In Lanarkshire, Dr. J. T. Wilson states in a report for the year 1909 that sixty-seven out of seventy-one collieries provided with coal-washing plants use settling ponds, the settled washing waters being re-used in sixty-four cases.

Messrs. Greaves and Holiday, giving evidence before the Royal Commission on Sewage Disposal with reference to coal-washing waters, stated that it could be fairly easily treated either by means of settling tanks or by passing the water through washed coal and mixing the "slimes" with the small coal for coking. Mr. Greaves stated that this was the normal procedure at nearly all the collieries with which he was connected.

At some collieries settling tanks are employed for the recovery of the larger particles of coal, while the tank liquor is pumped into holes excavated in waste shale heaps. In such cases the resulting effluents are often very clear and bright, and they contain practically no matter in suspension.

Frequently, as in the case of the china-clay industry, it is possible to embank areas of flat-lying ground with shale, &c., and to pump the waste waters into the ponds thus formed. In this case the water filters through the embankments, and is then usually fit to be discharged direct into a stream. Most collieries getting up fairly clean coal could settle the wash waters which they discharge so as to come within some 4-5 parts of suspended matter; but in the case of collieries producing dirty coal it seems doubtful whether these figures could be attained without the use of chemicals. Very much depends upon how often the tanks or settling ponds are cleaned out.

Mr. Kershaw's next article will deal with the wastes from lead and tin mines, gut factories and piggeries.

National Guard: Corps of Engineers.—As one of the societies which includes among its members professional engineers, the council of the Royal Sanitary Institute have been asked to call the attention of the members to the Engineers' Company which is being formed in connection with the City of London National Guard Volunteer Corps, raised under the presidency of the Lord Mayor of London. The intention is to enrol in this company those who have had definite engineering training, and who are above the age limit for military service, so as to join a technical branch of the main corps. Full particulars can be obtained from the Secretary of the Corps, 99 Gresham-street, E.C.

SURVEYORS AND ARTICLED PUPILS.

URBAN DISTRICT COUNCILLORS' DISCUSSION.

The Finance Committee of the Batley (Yorks) Urban District Council submitted recently, according to a report in the *Yorkshire Post*, a recommendation that the surveyor, Mr. J. E. Aldersley, should be authorised to take a pupil into his office, the premium to be arranged between himself and the pupil, and such premium to be spread over a period of three years.

Councillor Driver, in moving an amendment that the finance minutes be passed with the exception of the above, said he wished to make it clear that he opposed the motion purely on a matter of principle. He contended that if it was necessary to appoint an articled clerk the appointment should be made on a basis of merit—that was, equal facility should be given for every parent in the district who had an eligible son for the vacancy. In his opinion the action of the council created a precedent, and would lead to difficulties in dealing with such matters in the future. The minute as it stood gave the surveyor power to arrange with any parent of any son with regard to the amount of premium which should be paid. That, in his opinion, should not be. The surveyor was empowered to treat with an individual who had the longest purse. The action took out of the hands of the council the authority which they ought to guard as keenly as they could—that of seeing that all persons should come before the council and be elected to the office to discharge their duties in a proper way. To him it did not look a business-like way of doing things.

Councillor Matthews seconded.

Councillor Duckworth said he did not agree with all Mr. Driver had said, unless he was prepared to pay the ratepayers' money in teaching an articled clerk.

Mr. Driver: I had no intention of spending the ratepayers' money, nor even suggested it. Therefore that remark is out of order.

Mr. Duckworth: There had been a suggestion made that the surveyor be paid out of the ratepayers' money for a pupil.

Mr. Driver: The statement I made was that I was prepared to give the matter consideration as to whether or not there should be an increase in the surveyor's salary. I have not agreed to do anything only from a point of view of consideration.

Councillor Horbury said he could not see what Mr. Driver hoped to obtain by taking the course he had done. The public would understand that they had got to pay or the boy's parents had got to pay. There was no doubt which side they would take.

The chairman said, so far as he was aware, in cases of other authorities who had an articled clerk, that clerk was articled to the surveyor. Either the ratepayers must pay or the boy's parents must pay a premium. Mr. Driver assumed that they would debar some poorer boy from the position, but he (the chairman) thought they should debar anybody being learnt a profession at the expense of the ratepayers.

The amendment was lost.

Society of Architects.—"The Law Relating to the Remuneration of the Architect" is the subject of a paper which Mr. A. Montefiore Brice, barrister-at-law, will read at a meeting of the Society of Architects to be held on the 11th inst. at 28 Bedford-square, W.C. The chair will be taken at 7.30 p.m.

Concrete and Weather.—At a recent meeting of Stonehaven Harbour Trustees a letter was read from the Fishery Board in regard to the concreting of the Old Jetty, the board stating that they were advised that the season was quite unsuitable for the laying of concrete, and that it would be desirable to suspend operations during February and March, and to push on faster with the removal of the copper dam. This being sent to Mr. Barron, Aberdeen, the Harbour Board's engineer, he reminded the trustees that dull, damp weather was the best suited for laying concrete. As the whole season had been, and promised to be, exceptionally open, he saw no reason to suspend the operations, and he pointed out that provision was made in the specification regarding the making of concrete during unsuitable weather. He therefore did not think it was in the interests of the trustees to order the suspension of any part of the works. It was agreed to send the engineer's reply to the Fishery Board.

Bituminous Materials for Road Construction.

STANDARDS FOR THEIR TEST AND USE.

At a recent meeting of the American Society of Civil Engineers the Special Committee on Bituminous Materials for Road Construction, and on Standards for their Test and Use, reported that it had continued its work as such since its report of 1913 until the first part of June, 1914, when the word "Bituminous" was deleted from the title of the committee. The result was to broaden considerably the field of the committee's work. But the committee has become aware of an expectation among many members of the society that something in the nature of a final report on bituminous materials would shortly be presented by this committee, and in the effort to meet this expectation, as well, also, as to release the committee for its work in the broadened field of its action, the attempt is now made to present a comprehensive report, and one as nearly final as may be, under all the circumstances, on "bituminous materials used in road construction, and on standards for their test and use."

The constitution of the committee is as follows: Messrs. W. W. Crosby (chairman), H. K. Bishop, A. W. Dean, N. P. Lewis, C. J. Tilden, G. W. Tillson, and A. H. Blanchard (secretary).

For more than fifty years (the committee observe) the use of bituminous materials of various kinds has prevailed in highway work to a greater or less extent in the United States, and for a longer period in some other countries. Except in the cases of a few materials, this use, until within ten years or less, had been marked by the variety of materials used, the variety of methods of use, the variety of results secured, the lack of standards for materials, methods and results, and the lack of appreciable advance in the science and art underlying the results.

In the exceptions referred to, which are meant to include the sheet asphalt and certain bituminous concrete pavements, it may be said that progress had been steadily, if somewhat slowly, made in the sheet asphalt work, and that the development of the bituminous concrete pavement rapidly advanced the science and art of bituminous pavements generally.

However, even including both these cases, as late as six years ago (1909) standards for materials were lamentably lacking. It was then customary, even where the specifications were otherwise all that could be expected, to describe the bituminous material by its trade name or as "equal to" a particular brand of fairly well-known character. Highway authorities generally knew little or nothing as regards means of identification of bituminous materials—even the asphalts coming under this statement—and no considerable agreement existed among engineers or chemists connected with highway work as to the analyses and tests desirable to be made on either the better-known asphalts or on the newer materials offered for use. A suggestion then made—to the effect that bituminous materials could and should be purchased under specifications which would describe their essential characteristics—met with discouragement and even ridicule from many quarters. . . .

Analyses and Tests of Bituminous Materials.

The adoption of the following lists of tests, as including all those probably of value in determining and recording the characteristics of the bituminous materials used in this connection, is recommended:

TARS.

Specific gravity at 25 deg. Cent. (77 deg. Fahr.).
Flash point.
Solubility in CS_2 (carbon disulphide).
Consistency at 4 deg. Cent. (39 deg. Fahr.), 25 deg. Cent. (77 deg. Fahr.), 46 deg. Cent. (115 deg. Fahr.), 98 deg. Cent. (208 deg. Fahr.).
Melting point.
Loss on evaporation at 163 deg. Cent. (325 deg. Fahr.).
Consistency of residue at 4 deg. Cent. (39 deg. Fahr.), 25 deg. Cent. (77 deg. Fahr.), 46 deg. Cent. (115 deg. Fahr.), 98 deg. Cent. (208 deg. Fahr.).
Melting point of residue.
Distillation.
Consistency of residue at 4 deg. Cent. (39 deg. Fahr.), 25 deg. Cent. (77 deg. Fahr.), 46 deg. Cent. (115 deg. Fahr.), 98 deg. Cent. (208 deg. Fahr.).
Melting point of residue.

ASPHALTIC MATERIALS

Specific gravity at 25 deg. Cent. (77 deg. Fahr.).
Flash point.
Solubility in CS_2 (carbon disulphide).
Solubility of bitumen in CCl_4 (carbon tetrachloride).
Solubility of bitumen in petroleum naphtha.
Character of the residue on glass.
Consistency at 4 deg. Cent. (39 deg. Fahr.), 25 deg. Cent. (77 Fahr.), 46 deg. Cent. (115 deg. Fahr.), 98 deg. Cent. (208 deg. Fahr.).
Melting point.
Ductility at 4 deg. Cent. (39 deg. Fahr.) and 25 deg. Cent. (77 deg. Fahr.).
Fixed carbon content.
Paraffin content.
Loss on evaporation at 163 deg. Cent. (325 deg. Fahr.).
Consistency of residue at 4 deg. Cent. (39 deg. Fahr.), 25 deg. Cent. (77 deg. Fahr.), 46 deg. Cent. (115 deg. Fahr.).
Melting point of residue.
Ductility of residue at 4 deg. Cent. (39 deg. Fahr.). and 25 deg. Cent. (77 deg. Fahr.).

At the present time it may be said that a number of important questions concerning the use of bituminous materials in highway work are desirable of investigation or of solution. Some investigations have been begun, but as yet have not been concluded successfully, mainly because of lack of sufficient time for the proof of certain principles. Other investigations should be begun and pursued under such a variety of conditions as will render the conclusions of general value. As the committee has before stated (in its report dated January, 1912), it believes "that, in order to solve many of the problems of construction and maintenance, it is more necessary to have at hand physical data recorded along uniform lines for a relatively short period than to prove the correctness of certain fine theoretical points," and therefore it again urges resistance to a tendency, apparent in some instances, to ignore the opportunity offered by the committee for collaboration, which would result in mutual benefit, and deprecates any tendency to return to the former chaotic conditions which would ensue from individual, non-concurrent effort.

Of the investigations above mentioned as begun, but as yet unfinished, the following may be mentioned as important and worthy of conclusion:—

(1) The effects of various kinds of earth or soil on bituminous carpets under known conditions of traffic.

(2) The efficiency of the use of asphaltic oils for surface treatments on gravel and broken stone roadways.

(3) The desirable analyses and tests to be made on bituminous materials for known conditions of use.

(4) The standardisation of a determination and expression of the consistency of bituminous materials which preferably may permit of its use on all the wide range of such materials, from liquid to solid, and of the inter-relation existing in certain, if not in all, cases.

(5) The causes of the formation of waves or corrugations in bituminous surfaces and pavements.

(6) The use of a volatile flux instead of the application of heat for the purpose of rendering the bituminous material or cement sufficiently fluid for use under any method.

(7) The maximum quantity of distillate coming over, up to 170 deg. Cent., from tars (as determined by the test proposed by the committee) which may be properly allowed in a material under any known conditions of use and traffic.

(8) The maximum and minimum quantities of free carbon that can be successfully allowed in tars under known conditions of other constituents of the tar, of climate, of traffic, and of methods of use.

(9) The advisability of incorporating in bituminous pavements, built by the penetration method, bituminous material in excess of the minimum quantity necessary for the production of satisfactory results.

(10) The relative efficiency of the various pressures used in the application of various grades and types of bituminous material in the construction of bituminous surfaces and bituminous pavements built by the penetration method.

(11) The variable amounts of the proportions of bitumen in bituminous concrete mixtures, dependent on the kind and character of the component parts of the mineral aggregates.

(12) The allowable maximum penetrations of various types of asphalt cements when such cements are used in bituminous concrete pavements which must be open to traffic shortly after being laid.

(13) The efficiency of bituminous concrete pavements constructed with a number of courses composed of different sizes of broken stone.

(14) The allowable minimum atmospheric temperatures under which it is practicable to secure the desired compression of bituminous concrete mixtures composed of various grades of different types of bituminous cements and different kinds of mineral aggregates.

(15) The use of "seal coats" on bituminous pavements under stated conditions.

Of the investigations before mentioned as important and worthy of commencement and prosecution, the following may be noted:—

(1) The establishment of standards for recording, compiling, and reporting costs of results secured in highway work.

(2) The establishment of standard forms of specifications for the various kinds of bituminous surfaces and pavements ordinarily used, including the bituminous materials therefor.

(3) The devising of standards for recording and compiling traffic censuses, especially to the end that comparisons of traffic can be made readily and with relative accuracy.

(4) The establishment and expression of any relation between the traffic and the life or cost of any bituminous surface or pavement.

COMMITTEE'S CONCLUSIONS.

The committee now submits its conclusions on bituminous materials [with the new or the modified forms of its earlier reported conclusions in brackets], as follows:

General.—The committee deplores the tendency, apparent in some quarters, to devote time and energy for the discovery of "the most satisfactory road surface," and expresses its conviction that there is no such thing as a "panacea" for all highway ills. It believes that, with the development of highway work, it should be constantly more apparent that one of the greatest problems to be solved by highway engineers is the proper selection of the particular material and form of construction to be used, which most efficiently meet the conditions of any particular case, and that progress will be hastened by complete recognition of this fact.

[Most materials and methods of use of bituminous materials have their values, and the real problems are the determination of these values and of their adaptability or fitness to meet the conditions of any case properly.

A bituminous surface or pavement properly designed for carrying light motor vehicles may not be the one best adapted to horse-drawn vehicles, and one which is efficient for light horse-drawn vehicles may be most seriously injured by motor vehicles. A solution of the problem of the proper design and construction of a roadway for mixed traffic is, under any local conditions on which the solution ultimately depends, difficult, though facts are accumulating which may finally permit this solution.

It is still desirable to record the characteristics and details (including cost figures) of use of bituminous materials, and great concordance in so doing is most necessary.]

Census of Traffic.—Your committee desires to emphasise the fact that experience has demonstrated the value of a traffic census taken both preliminary and subsequent to the construction of a highway.

The traffic census should be considered one of the most important variable factors in the solution of that important problem, the selection of that type of construction best suited to local conditions considered from the standpoints of both economy and efficiency. In connection with the census returns on any highway should be considered the traffic on cross and parallel highways, and the effect of improvement of these highways on the traffic of the highway under construction.

It should not be taken for granted that the bald return of a traffic census should be the sole basis of the selection of the type of construction, but it should be considered a guide in determining the value of the type adopted.

Where motor traffic forms a considerable proportion of the total traffic likely to use a highway, the unit width of traffic lines should be considered as 9 ft. or 10 ft., instead of 7 ft. or 8 ft., as heretofore, because of the greater clearance required for the safe passing of the units of such traffic.

[In considering the effect of traffic and its relation to the design and cost of maintenance, it is necessary to take into account the speed as well as the weight of the vehicles.

In view of the recent constant and rapid increase of traffic on the highways, both in number of vehicles and in wheel loads, it will be in the interests of economy for designs of highways to be made with proper consideration of further increases.]

Collection and Standardisation of Cost Data.—In the work of the committee it has become apparent that conclusions may necessitate the use of cost data, recorded along uniform lines. It seems to be urgent that standards for arriving at costs be established and generally adopted as promptly as possible. Your committee therefore recommends to the attention of the profession this important feature of engineering work, with the hope that uniform methods will be generally adopted at an early date for reporting costs of construction and of maintenance.

[The committee believes that, along the lines of standardisation in reporting cost data and for general benefit, it would be advisable for highway departments, in making their regular periodic reports, to adopt a tabular form for presenting their records of the costs of their construction work, which should include data or figures in columns as follows:—

Identification of work.
Description (width, thickness, and material or form of construction).
Length.
Area of bituminous pavement or surface.

Construction expenditures for:
- Preliminary surveys and plans.
- Grading.
- Surfacing.
- Bridges and culverts.
- Under-drains.
- Superintendence and inspection.
- Miscellaneous.

Total of above.
Rights of way and damages.
Total construction and rights of way and damages.
Administration, legal and general engineering expenses.
Total expenditures and overhead expenses.

For the maintenance expenditures there should be a tabular form showing, in columns:—

Identification of work.
Length.
Area.

Maintenance expenditures for:
- Labour.
- Material.
- Hire of teams and equipment.
- Inspection and superintendence.
- Miscellaneous.

Total of above.
Administration, legal and general engineering expenses.
Total cost of maintenance.

Each table, of course, should carry such footnotes or text as might be necessary to supply the further information as to unusual rates of pay or other conditions advisable to be shown.

In compiling costs of any item of work done, the committee believes that it would be advisable and of great public benefit if hereafter all such figures be compiled, whenever practicable, on the following basis:

Total cost to be reported per unit for:
- Cost for materials delivered on site of work.
- Cost for labour and teams placing materials.
- Cost for machinery engaged in placing materials and in finishing the work.
- Cost for inspection and superintendence.
- Cost for general overhead charges.

In footnotes or in the text such statements as may seem desirable in any case should be made concerning rates of pay, conditions and circumstances.]

Construction—General. Your committee is agreed that:

[The use of any form of a bituminous pavement or bituminous surface does not preclude the necessity for the construction of a well-drained, thoroughly compacted, and adequate foundation. In fact, such improvement of the highway frequently attracts heavier traffic, and thus increases the stresses on the subgrade.]

Within certain limits of traffic the proper use of bituminous material should effect economy in the expenditures for the cleaning and maintenance.

[The proper treatment of a broken stone, gravel, shell or slag roadway with bituminous material for the purpose of eliminating the so-called dust nuisance will at the same time render even the best of such roadways more efficient for sustaining traffic, and such treatment with bituminous materials is usually preferable and more economical than sprinkling with water or the use of hygroscopic salts.]

An objectionable slipperiness of bituminous pavements or bituminous surfaces may be decreased or prevented by proper precautions during construction or by proper treatment thereafter.

[The crown generally used in the construction of broken stone roadways is excessive when bituminous materials are used, and a crown of even ¼ in. per foot should be avoided when a lesser crown can be secured without detriment to the surface drainage.]

Construction—Materials. Your committee is agreed that:

For the present, at least, whenever comprehensive specifications are to be prepared so as to admit a variety of types of bituminous materials, separate specifications as may be necessary should be prepared for each type.

Where bituminous pavements are laid, the edges should be protected and a sudden transition from the pavement to any softer shoulder material avoided by means of cement concrete or other edgings, and such reinforcement of the shoulder material as may be necessary.

The character of the stone to be used may influence the choice of the bituminous material.

Whatever method may be used, in any case it is essential, as in water-bound construction, that a suitable quality of road metal be used.

By proper selection and use of the bituminous material, injury to property and deleterious effects upon animal and vegetable life may be avoided, and also considerable hygienic advantage may result from the use of such materials on the highways.

The maximum quantity of distillate up to 170 deg. Cent. allowable in tars depends on the proportions of the other fractions in a tar, and on the conditions of use of the tar, and possibly on the conditions on the road surface after its construction, or on some other facts.

Construction—Methods. [Your committee wishes to emphasise the fact that the selection of the method of construction to be used in a given case will depend on the results of preliminary investigations, and that the recent and imminent development of, and the availability of, mechanical appliances should affect the decision to a great degree.]

Whatever method of construction is selected, the use of a bituminous material by no means justifies any lack of care in the ordinary details to be followed, but rather increases the need for thoroughness and skilled supervision.

The main principles underlying perfection in water-bound roads remain in full force when such roads are treated with bituminous material.

In all uses of bituminous materials in highway work the use of proper machinery is preferable, wherever conditions make such practicable in any part of the process, to the use of hand labour.

The use or omission of a seal coat on bituminous pavements is dependent on one or more of the following points:—

(*a*) The character of the bituminous material used.
(*b*) The method of construction.
(*c*) The density and quality of the work done.
(*d*) The kind and amount of traffic to be expected on the completed highway.

[The length of time that the finished pavement should be closed to traffic varies from a few hours to several days, dependent on the character of the bituminous material used, the method, and on climatic and other local conditions.]

Construction—Mixing Methods. Your committee is agreed that:

[Where the character of the traffic justifies the use of a bituminous concrete pavement, it also demands a correspondingly strong foundation.]

The quantity of bituminous material to be used in any case will depend on the peculiar conditions of that case, such as the kind of road metal and of bituminous material, the character of the aggregate, the climatic conditions, &c.

[The fluidity of the bituminous materials used should be sufficient to ensure a proper coating of the mineral particles, and such fluidity may be obtained by heating, provided the degree of heat is not excessive or sufficient to injure the bituminous materials, and is reached through proper methods.

The bituminous material should possess adhesive and cohesive qualities sufficient to enable it to perform its purposes properly under the conditions of any case, and it should not be of a greasy character.

The adhesiveness, cohesiveness, resiliency, and elasticity of the material should have the greatest possible permanence.

The success of results depends largely on the use of proper sizes of the particles, and on securing a proper density of the mixture for the local conditions.]

The character of the mineral aggregate to be used may be controlled by local conditions, but the best results can only be obtained by the use of the best materials. Excessive sizes, or excessive variations in the size of the mineral particles, should be avoided, and the utmost care must be taken to avoid the segregation of particles of different sizes.

Mixing machines should be used, and hand-mixing methods should be avoided wherever practicable.

The success of results is greatly dependent on the degree of uniformity obtained in spreading the mixture, and on the proper rolling and compacting of the mixture. Too heavy a roller should not be used.

Care should be taken in prescribing or laying any seal coat that invitation or excuse is not given for inferior prior work, and its concealment by such a seal coat.

[The use of fine sand on top of bituminous concrete is open to grave objections, and the use of clean stone chips or small gravel free from particles that will pass through a ten-mesh sieve seems preferable.]

Trap rock in sizes greater than that passing a 2-in. screen should be used with caution in the construction of the upper course unless voids of the same are properly reduced, because of the likelihood of the individual stones to rock under traffic.

In the use of a heated aggregate for the construction of a bituminous concrete pavement, non-uniformity or excess in the heating of stone should be avoided.

Construction—Penetration Method.—Your committee is agreed that:

[An important factor for successful results is the proper compaction by rolling of the road metal before the spreading of the bituminous material.

The use of pressure distributors is to be preferred to hand-pouring applications.

The bituminous material should be sufficiently, but not excessively, fluid when used.

The bituminous material should be sufficiently adhesive and cohesive to carry out the purpose for which it is used, and should not be of a greasy character.

The essential characteristics of a bituminous material—such as adhesiveness, cohesiveness, resiliency and elasticity—should have the greatest possible permanence.

The needed penetration of the material into the rolled stone is had when the bituminous material reaches to the bottom of the average-sized stone in the course penetrated.

With the use of materials susceptible to heat, or fairly so, or otherwise of considerable fluidity during application or for a reasonable period thereafter at normal temperatures, the application of the bituminous material to the rolled stone can well be stopped on a line parallel to and within the edges of the stone, and reliance may be had for this border of the macadam becoming properly bound by the flowing of the bituminous material into it under heat and traffic. With the use of materials having the opposite characteristics, the application of the bituminous materials should be made fully to the edges of the rolled stone.

Present indications are to the effect that the use of bituminous materials in quantities of more than 2½ gallons per square yard, where the upper course of the macadam is to be 3 in. in thickness after compaction, is inadvisable under the penetration method, although sufficient data do not yet seem to be at hand to determine exactly upon the value or possible

advantage of using bituminous material in excess during construction in order to furnish a seal of pores by means of excess, is pledging the life of the surface of the bituminous pavement.

The use of fine sand on top of the bituminous material is open to grave objections, and clean stone chips or small gravel, free from particles that will pass through a ten-mesh sieve, is preferable.]

Constructive Surface Treatments.—Your committee is agreed that:

[The success of surface applications is proportionate to the adhesion obtained by the bituminous material to the old roadway surface, and such degree of cleanliness of the latter must be secured, by means of sweeping or other methods, as will ensure a proper degree of adhesion.

The roadway surface should be dry when the bituminous material is applied.]

Whether or not the application of bituminous material is to be followed by an application of mineral material and the length of time to be allowed to elapse between the application of bituminous material and subsequent application of mineral material, depends on local conditions and on the character and viscosity of the bituminous material used.

[To be successful, a carpet must be able to absorb shocks sufficiently to prevent disintegration by such shocks of the surface to which it is applied.

The bituminous material should be sufficiently, but not excessively, fluid when used.

The bituminous material should be sufficiently adhesive and cohesive to carry out the purpose for which it is used under any conditions, and should not be of a greasy character.

The adhesiveness, cohesiveness, resiliency and elasticity of a bituminous material used for this purpose should be of the greatest possible permanence.

The application of bituminous materials should in all cases be carried well over the outside edges of the rolled metal, and on the shoulder far enough to protect the edges of the metalled surface.

The use of fine sand on top of the bituminous material is open to grave objections, the use of clean stone chips or small gravel, free from particles that will pass through a ten-mesh sieve, being generally preferable.]

Attempts to construct and maintain by bituminous surface treatments a carpet of a greater total thickness than ½ in. have generally been unsuccessful, and in the construction of a successful carpet of a total thickness approximating ½ in., the materials should be applied in layers at intervals rather than by the construction of the total thickness in one application.

The quantity of bituminous material [1] to be used depends on the local conditions in any particular case, but excess in any application is to be avoided, as a deficiency may be corrected by a subsequent application, whereas an excess in any application is difficult, if not impossible, of correction.

The success of results depends first on the condition of the surface to which the treatment is applied. Even the best surface treatment cannot correct defects in the original surface, though it may reduce or modify them.

The application of the bituminous material by means of a pressure distributor is, wherever practicable, preferable to gravity or hand-pouring methods.

[Considerable evidence seems to make undesirable the presence of free carbon beyond a maximum, dependent on the distillate between 170 deg. and 300 deg. Cent., in tars for superficial treatments, in order at least to avoid brittleness at low temperatures.]

The maximum quantity of residue allowable in an asphaltic oil used for superficial treatment should be as great as permitted by the physical conditions of its use, subject to certain limits in the penetration of this residue, and such limits in penetration should be

A minimum which will ensure against undesirable hardness or slipperiness under travel at low temperatures;

A maximum which will ensure against undesirable softness or lack of body at the highest temperatures to be expected after use on the road.

Maintenance and Repairs.—Your committee is agreed that:

Repairs to bituminous pavements and bituminous surfaces should be made so as to secure immediately the greatest possible homogeneity.

It is even more necessary than with many other types of construction to carry out repairs on bituminous pavements and bituminous surfaces immediately the desirability for them appears.

Nomenclature.—Your committee wishes to advise strongly the discontinuance of the use of the terms "tarred macadam" and "asphaltic concrete," as these terms are meaningless in many cases, and unnecessary when proper tests, such as are suggested by your committee, are used.

(To be concluded.)

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Has any concerted opinion yet been arrived at as to whether the work of surface tarring a road is better and more cheaply performed by machine or by hand labour? Have any reliable statistics ever been published showing the alternative cost and ultimate results of these two processes? Would not some authoritative statement on this question be of great value?

* * * * *

Were not the remarks on housing contained in Mr. A. P. I. Cotterell's recent presidential address to the Institute of Sanitary Engineers of extreme interest? Who [illegible] the details in regard to the conditions under which some of our poorer brethren are housed without being deeply impressed? But does not the problem of the remedy resolve itself into the question, Shall local authorities devote a portion of the rates to providing housing accommodation for some of their population who cannot or will not pay the rents [illegible]? And, if so, where is the line to be drawn at which this premiated privilege is to be granted?

* * * *

Is not Mr. Alderman Dixon, vice-chairman of the Cumberland County Council, to be congratulated on his speech at the annual dinner of the Northern Division of the Institution of Municipal Engineers, in which he said that if councils wanted properly trained officials they should pay a reasonable salary? Is it not evident that, so long as local authorities pay inadequate salaries, they run the risk of spending far more of the ratepayers' money as a result of improper design and supervision of their public wants? Is it not often the case with councillors that they are "penny wise and pound foolish"?

* * * *

Is it a fact that the Road Board are refusing grants-in-aid to some highway authorities on the ground that grants in future will only be made where there is labour distress through unemployment? And is it a fact that, so far as can be ascertained, there is not any distress of this kind in any part of the country; but that, on the contrary, it is difficult to find sufficient skilled labour for road work? Is it not also a fact that unskilled labour is worse than useless for modern road construction or maintenance?

* * * *

Are there not objections sometimes raised by drivers of heavily loaded slow traffic that the request to keep to the "near-side" kerb is impossible if there is much camber on the road? Do not these objections take the form of saying that, when once there, it is a strain on the horse to pull the load out again, that there is a danger of things falling off if the load is high, and that, in any case, to be there is a strain on the horse, and that there is also the danger of his slipping sideways? Is there not some truth in these objections?

* * * *

What has been done with regard to the recent order making compulsory the carrying at night of a red rear-light by all vehicles in the metropolitan area? Did not this order come into force on January 1st of this year? And, if so, how many horse-drawn vehicles have obeyed the order? Are the police too busy watching for Zeppelins to observe the scandalous breach of this order, which, owing to the present darkened streets, make vehicular traffic very dangerous?

Manchester Highway Employees and the War.—There are 1,140 persons in the Manchester Corporation Highways Committee's employment, but only 626 come within the prescribed ages for military service. Of this number 274 reservists, Territorials, and volunteers presented themselves for service. All were accepted except fifteen, who did not come up to the required standard, so that 259 have actually joined the colours, making a percentage of 43·77. A few more men in the department have offered themselves for service in the new pioneer or engineering corps which is being formed.

DIRECTION POSTS.

By "Observer."

At various times there have appeared in The Surveyor articles having reference to direction-posts, but dealing with these from a county council or borough standpoint.

Some of the elaborate examples of sign-posts, reflecting mirrors, and semaphore plan signs intended

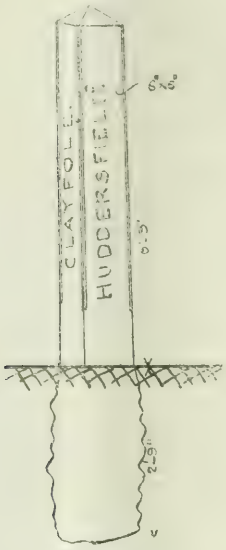


Fig. 1.

for use at road junctions through which a large volume of motor traffic passes (Fig. 2), while within the reach of wealthy corporations, would be out of place in and beyond the means of the majority of rural districts and the smaller urban areas.

In districts somewhat remote from the great hives

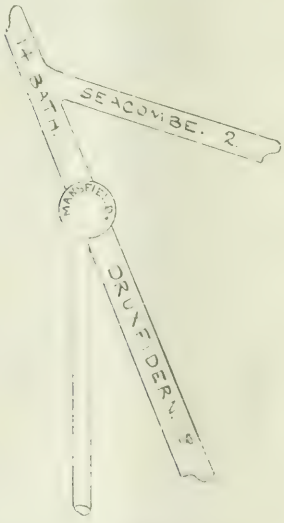


Fig. 2.

of industry, and off the track of the fashionable car-journeying to our seaside and health resorts, a well-made, well-fixed wood wing-post (or cast iron of moderate cost) will suffice, except for dangerous road junctions over which passes a fair amount of light fast traffic.

I am afraid many of the highway surveyors in their daily rounds have not given the subject of sign-posts their attention, and in the accompanying sketches I give examples of design and fixing which betray a lack of sympathy with the altered conditions of traffic and due respect for the rights of the

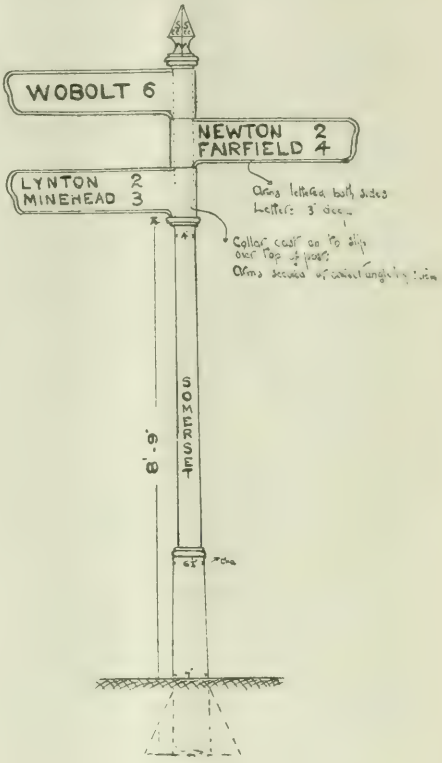


Fig. 3.

travelling public. One sees new posts erected in the same blind corners and constructed in the same old style, without the slightest regard for the elementary rules of cautious driving and the safety of life and limb.

Take, for example, the "straight" post (Fig. 1), common in certain localities, and so fixed as to be

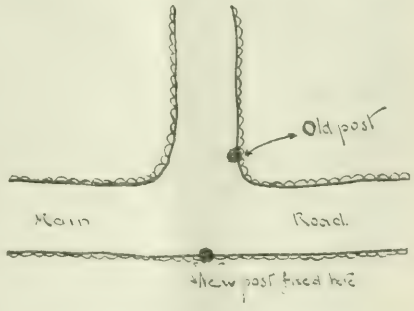


Fig. 4.

visible from one of the junction roads only. And picture a motorist in taking the sharp junction attempting to read the lettering on the post. Sometimes the posts finish with a rounded and sometimes with a pyramid apex, but usually they are cut off square, and have a "ball capping" dowelled on. This capping is often missing, allowing the wet to soak into the pores of the unpainted wood to hasten its destruction. Often hauled from the wood straight to the

...rw-bench, and thence to the painter's shop, its post-...two after a few weeks' ... lonely vigil is not always ...ceed, and the writer has known of cases in sparsely-populated agricultural districts where the county ...oked has played a joke upon the unwary traveller

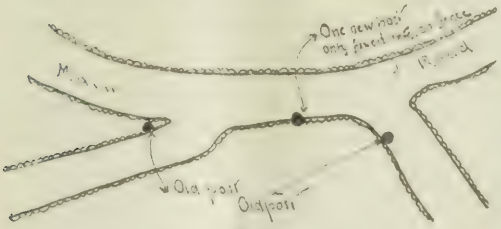


FIG. 5.

...to path, reversing the ... at a four-cross-way, entailing a several-mile longer tramp or drive for the unsuspecting victim. Needless to say, wing-posts, fixed in more advantageous positions, should take their place.

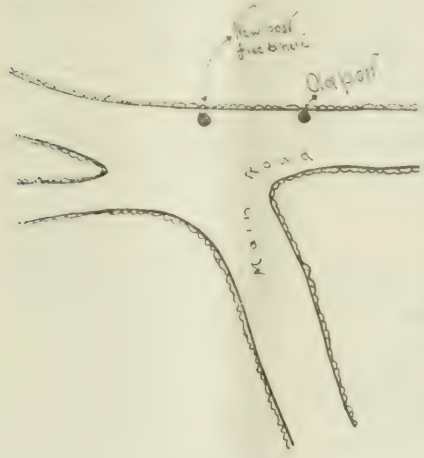


FIG. 6.

Another example is the stumped granite post resting on a never-stumped fence, with a little wood-stump-post fixed fatherly upon its dowelled seat. A third example is the skeleton iron post, ofttimes

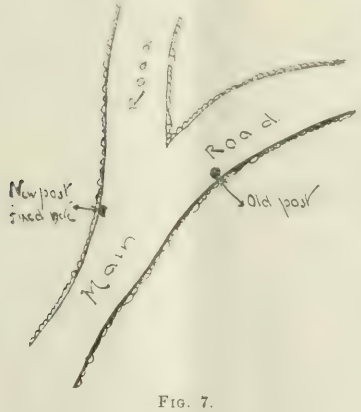


FIG. 7.

hidden from view by the branches of trees and tall bushes, and denied even a single protecting coat of paint.

Where wing-posts are erected the lettering, anything from ¾ in. to 1½ in. in depth—may be laboriously ...pur on by ... instead of being fixed one above the other, are usually fixed in the ... Some authorities paint the post and arms black, with white lettering to remove the gloom. Another fault is the indiscriminate ... within a reasonable radius of the district. The names of small hamlets is of very little use to motorists and travellers, for whose benefit, chiefly, the posts are supposed to be erected.

For the mutual advantage of all the name of the parish may be given on the post itself below the arms, and if the sign is on a county road, the name of the county, or an abbreviation of it, may usefully appear on the top portion of the post above the arms.

A post well adapted for important main roads in rural districts is of the type designed by Mr. H. T. Chapman, formerly county surveyor of Somerset, and now county surveyor of Kent (Fig. 3). For less important roads where the expense of fixing the cast-iron posts would be prohibitive, good, sound-heart oak posts with well-seasoned red deal arms, solidly put together and securely fixed in the most advantageous positions, should take the place of the old-fashioned types referred to. The ratio of cost, approximately, of cast-iron and wood posts is 2½ to 1. The various motor signs might also be more advantageously fixed by being placed at an angle to face the traffic instead of parallel with the road fence—on the "near," and not the "off" side, and about 140 ft. from the place to which they apply, instead of ... on the other extreme ... on.

Sketches 4 to 7 show examples of bad fixing—generally of the type of post described in the beginning of these notes. The sketches also show where, in the writer's opinion, wing-posts should be fixed.

MANCHESTER MAIN DRAINAGE.

AN INSPECTION OF THE WORKS.

... the meeting ... the Royal Sanitary Institute at Manchester on the 19th ult.—reported in our issue of last week—concluded on the following day with an inspection of an interesting section of the city main drainage scheme. The members of the institute were welcomed at the town hall by Alderman Frowde, J.P., chairman of the Rivers Committee. Alderman Frowde was, unfortunately, not in sufficiently good health to accompany the visitors, but his place was ably filled by Mr. Bullough, the resident engineer, whose lucid descriptions made the visit thoroughly instructive and enjoyable.

The work was commenced in April, 1912, and about 18 miles of sewers have been completed, ranging from 15 ft. 3 in. diameter downwards, at a cost approximating £1,000,000.

The work No. 3A, which was first visited, is being carried out by the corporation staff, without the ... diameter, with four courses of Accrington engineering bricks in cement mortar. The sewer is chiefly in open cutting, but a portion of the sewer just about to be constructed will run under the Cheshire Lines railway tunnel.

The work No. 2A, which was next visited, is being carried out by Messrs. E. Nuttall & Co., Manchester, and is also 13 ft. in diameter. This sewer runs under the Bridgwater Canal, being divided into twin sewers at this point, 13 ft. high and 9 ft. 6 in. greatest width. The members were able to go through these sewers, and the dryness of the walls spoke eloquently of the efficient manner in which they were constructed.

Halesworth and Rotherham Town Planning Schemes.—It is understood that the Local Government Board have given authority for the preparation of town planning schemes under the Housing, Town Planning, &c., Act, 1909, by the rural district councils of Halesowen and Rotherham, relating to areas of about 650 and 1,180 acres respectively.

Cottages for Rural Districts.

BOARD OF AGRICULTURE COMMITTEE'S REPORT.

The Board of Agriculture and Fisheries are bringing to the special notice of public bodies, societies and persons interested in rural housing the report of the Advisory Committee appointed by the President of the Board on November 20, 1913, to consider and advise upon plans, models, specifications and methods of construction for rural cottages and outbuildings. The committee consisted of Mr. Christopher Turnor (chairman), Mr. Cecil Harmsworth, M.P., Mr. Raymond Unwin and Mr. Lawrence Weaver. Mr. C. E. Varndell, of the Office of Woods, was appointed subsequently as an additional member.

Pair of Cottages Similar to Design No. 1, Built at Earswick, York.

The report of the committee* contains illustrations of twenty-three types of cottages for rural labourers, with notes as to the suitability of each type to particular circumstances of site, aspect, materials, &c. Four designs are for single cottages (including two bungalows), thirteen are for pairs, and six for blocks of four. The accommodation provided includes a living-room, scullery, larder and three bedrooms. In two instances (in addition to the bungalows) the third bedroom is on the ground floor, and might be used alternatively as a parlour, while in two other cases a parlour is provided in addition to the accommodation already mentioned.

Ten of the designs represent a selection made by the committee from the prize-winning designs in the cottage planning competition organised by *Country Life*. Of the remaining thirteen, the majority were specially prepared for the committee.

The text of the report includes chapters (among others) on the requirements of the rural labourer, the design and structure of the cottage, drainage and water supply. A standard specification is printed in an appendix.

WORKING DRAWINGS AND SPECIFICATION.

The designs from which the illustrations in the report are reduced are published separately on the scale of ¼ in. to the foot. The price of each sheet is 1s. (post free 1s. 1d.), and the drawings may be obtained in the same manner as the report itself.

The specification has also been placed on sale separately at the price of 1d. (post free 1½d.).

Facsimile pages of the report itself containing a list of the plans with dimensions and two plans with descriptions are reproduced herewith.

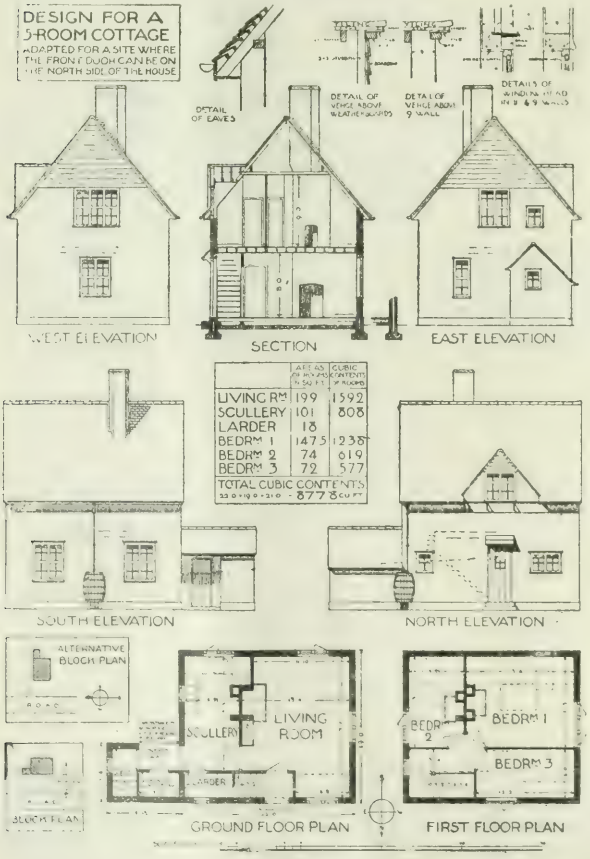
DESIGN NO. 1.

This plan is suitable for a district where brick, brick and roughcast with flat or pan tiles are the prevalent materials. Where weatherboarding would be unsuitable the gables can be tile-hung or built in brick like the remainder of the walls. The design is adapted for sites where the entrance is best placed on the north side of the house, the road being on the north or west as indicated in the alternative block plans. If so placed, the living-room and scullery are both sunny rooms, while the living-room has also an outlook to the road.

The design is made to provide, in the smallest rectangular building, three bedrooms on the first floor, of the minimum size to accommodate, in No. 1, parents and one child; in Nos. 2 and 3, two young children or one adult in each.

It is preferable where possible to have the second bedroom of larger size than provided in this plan.

With this accommodation on the first floor, and the earth-closet and coals in an outbuilding which serves to screen the back door, a good-sized living-room and scullery can be provided on the ground floor, comfortably arranged with



Design No. 1.

*To be purchased, either directly or through any bookseller, from Wyman & Sons, Limited, 29 Breams-buildings, Fetter-lane, E.C., and 28 Abingdon-street, S.W., and 54 St Mary-street, Cardiff; or H.M. Stationery Office (Scottish Branch), 23 Forth-street, Edinburgh; or E. Ponsonby, Limited, 116 Grafton-street, Dublin. Price 2s. 6d. post free 2s. 9d.

the ground is paved, so to leave the greater part of each room undisturbed.

The cottages could be built of cavity construction, a small cavity being provided between the front and back walls, and where the site was suitable.

On sites where drainage is available it is possible to put a combined range and cooker under the room next to the entrance.

DESIGN NO. 8.

This design is suitable for a district where bricks with flat or pan tiles or slates are used, and for positions where the simple lines and sash window treatment would be appropriate.

This plan provides one of the most convenient and economical of cottages, and has been widely used; several of the designs here published will be found to be slight variations upon it.

The design provides a recessed and contemplative living-room, with a serviceable scullery, and on the first floor three bedrooms of sufficient size to accommodate, in No. 1, parents and one child; in No. 2, two grown-up children; and in No. 3, two young children or one adult.

The arrangement of the staircase and bedrooms in this plan economises slightly less space than it does in No. 5, the lighting also has less frontage, and is slightly deeper. Both these points make for economy in cubic contents and in brickwork, the party walls which serve two houses being longer, and the outer walls shorter. The plan, however, requires a site with a aspect nearly due south, as two bedrooms face to the back, and in the centre houses the staircases must be lit and ventilated by small dormer windows high up in the roof, controlled by cords, which are not so convenient as ordinary windows, or so likely to be opened.

The design could be used to different architectural treatment to suit the local circumstances, owing to the fact that only four windows need be used on each floor on the front elevation.

Where a more picturesque treatment would better accord with the surroundings, a useful group may be made by using the two centre houses from design No. 5 and the two end houses from this group. All the staircases could then be lit by windows on an outside wall.

Town Planning Institute.—A paper, entitled "Some of the Larger Problems of Town Planning," will be read by Mr. Thomas H. Mawson, HON. ASSOC. R.I.B.A., at a meeting to be held at 9 Conduit-street, W., on Friday, the 17th inst., at 8 p.m.

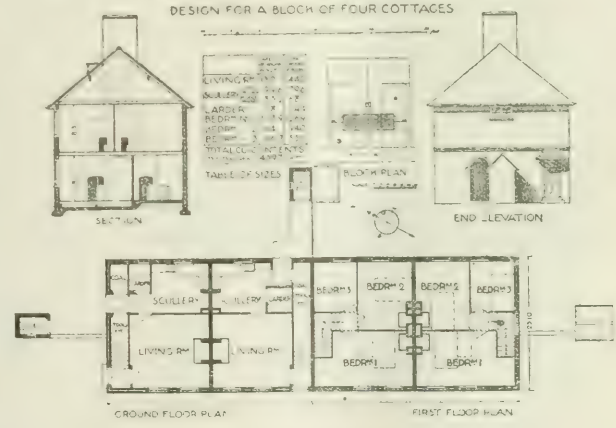
Town Planning at Scotstoun.

The District Committee of the Upper District of Renfrewshire and the Corporation of the City of Glasgow have both asked the Local Government Board for authority to apply a town planning scheme to the area lying between Victoria-drive, Scotstoun, on the east and the boundary of the burgh of Clydebank on the west. The area is about 840 acres in extent. It has a river frontage of 1¾ miles on the south, and is bounded on the north by the county of Dumbarton. The district includes several industrial works.

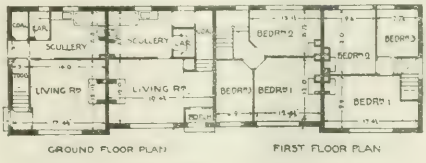
TRADE NOTES.

Sir William Mather, chairman, presided at the annual meeting of Mather & Platt, Limited, on Friday last at the company's works, Manchester. Comparing

the results of [illegible] with 1914 he said that, [illegible] opinion, they were very satisfactory. A divi-



DESIGN NO. 8.



DESIGN NO. 8A.

dend of 10 per cent on the ordinary shares plus a bonus of 2½ per cent, free of income-tax, had been declared. In arriving at their statement of profit during the past year the directors had thought it prudent first to secure the business against unforeseen contingencies that might arise in consequence of the unprecedented situation created by the sudden change from long years of universal peace to that of war on a colossal scale. They therefore decided not to add to the already large reserve fund, but to carry forward a larger sum than ever before—£66,838. Large dividends during war times should not be a primary consideration with company directors and shareholders; they should first try to provide as much work as possible at wages that would enable workmen reasonably to nourish themselves and their families, having due regard to the avoidance of waste and self-indulgence. Business profits earned under those principles might be small, but shareholders ought to bear the sacrifice of part of their dividends as their contribution towards the relief of the universal suffering which the war had caused.

Highways Construction, Limited, Finsbury-court, Finsbury-pavement, E.C., are issuing to their customers a wall calendar of striking design. The firm, as is well known, are the makers of voidless asphalt macadam roads on the single-coat, two-coat and carpet systems, and an illustration of a section of their two-coat work is an interesting feature of the calendar.

Coast Sand Dunes (By Gerald O. Case. St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian*.

Cottages for Rural Districts.

(See Preceding Pages.)

Table showing Cubic Contents and Cost at the rate of one Penny per Cubic Foot of each of the 23 types of Cottages illustrated in Report.

Number and description of design.	Cubic contents of one cottage with outbuildings.	Price at 1d. per cubic foot.*	Remarks.
	Cubic feet.	£ s. d.	
1. Single ...	9,463	39 8 7	Minimum of bedroom accommodation, sufficient for two persons over 10 and five under.
2. Bungalow	10,905	45 7 1	
3. ,,	11,515	47 19 7	
4. Pair	9,416	39 4 8	
5. Block of four.	11,669	48 12 5	
6. ,,	12,086	50 7 11	One of the middle houses has a larger bedroom, extending over archway.
7. ,,	9,655	40 4 7	
8. ,,	11,697	48 14 9	In the middle houses the scullery is somewhat smaller.
9. ,,	9,150	38 2 6	The dimensions of the living-room and scullery vary in the block.
10. ,,	9,552	39 14 2	Third bedroom in attic—maximum of bedroom accommodation sufficient for three persons over 10 and five under.
11. Pair	11,419	47 11 7	
12. ,,	8,486	35 9 8	The third bedroom is on the ground floor and would often be used as a parlour.
13. ,,	8,769	36 10 9	
14. ,,	9,225	38 9 7	
15. ,,	8,757	36 9 9	
16. ,,	8,646	36 0 6	
17. ,,	10,146	42 5 5	
18. ,,	9,984	41 11 11	The second cottage is a little smaller.
19. ,,	8,718	36 6 6	
20. ,,	9,751	40 14 7	
21. ,, ...	10,227	42 12 3	
22. Single	8,370	34 17 11	The third bedroom is on the ground floor and would often be used as a parlour.
23. Pair	7,952	33 2 8	

* A rough estimate of the cost of each cottage, pair of cottages, or block of four can be obtained by multiplying the figure in this column by the local building price per square of roof, and then in the case of pairs or fours by the number of houses. Thus in a district where 4d. per cubic foot is a fair average price for houses in blocks of four the estimate for block No. 10 would be: £39 14s. 2d. × 4 = £159 16s.

† Outbuildings not included.

Obstacles against Accurate Estimating.

Attendance on Sub-Contractors.

The Council of the Surveyors' Institution, in a letter to the council of the Society of Architects covering a memorandum on this subject, stated that a deputation from the Institute of Builders, received by the Quantity Surveyors' Committee of the institution, drew special attention to the obstacle against accurate estimating imposed by the practice of leaving in bills of quantities the cutting away and attendance on sub-contractors to be priced in a lump sum by the principal contractor. In modern buildings the hot-water work, sanitary work, and electric wiring is usually considerable, often, indeed, very extensive, and this class of work, too, is frequently delayed until the building is in an advanced stage necessitating a good deal of work which might be avoided were the requirements known earlier.

Accurate estimating is to the advantage equally of the building owner and of the contractor, and the council of the Surveyors' Institution feel sure that anything which can be done to secure an improvement in that respect will receive the ready support of architects.

The Quantity Surveyors' Committee are satisfied that the builders are not without some ground for complaint, and that the importance of dealing in adequate detail with "attendances" is not fully realised by all who practise as quantity surveyors.

They are of opinion that the matter should be dealt with more precisely than is frequently the case in preparing bills of quantities in order to obviate the friction which often arises between the parties to a contract owing to a misunderstanding as to the liabilities imposed respectively upon the building owner, the general contractor, and the sub-contractor. The following notes and suggestions are therefore recommended for the consideration of members of the institution.

The word "attendance" does not comprise any works of construction—*e.g.*, pipe trenches, castings, &c.—but it does comprise all cutting away and making good after, receiving materials and providing storage space for them, providing water, allowing the use of erected scaffolding and fixed plant. If so provided in the contract it should also be taken to cover the payment of accounts as certified by the architect before their inclusion in the general certificates.

The particular matters dealt with by the builders' deputation were:—

(1) Attendance on heating engineers.
(2) Attendance upon hot-water engineers.
(3) Attendance upon electricians.

In dealing with attendance on these or other special tradesmen, there should be given an account, as detailed, clear and succinct as possible, of the work which it is proposed the sub-contractor shall do, stating precisely what services will have to be rendered to him.

When the sub-contract is of minor importance, all the needs of the case will be met by leaving the estimator, after inspecting the drawings, to assess the value of the work to be done in this connection and set it down against the descriptive item.

When the sub-contract is important, the same account of the work to be done should be given, and, in addition, an indication of the extent of the attendance, stating—

(1) The number of holes for pipes, &c.:
(2) The number of pipe brackets, &c., to be fixed;
(3) The chases for pipes, &c.;
(4) The number of the points for electric lighting, electric bells, radiators, sanitary fittings, &c.

A general item to the following effect should also be inserted:

"In so far as is possible, an indication has been given of the specific attendance required, but the contractor is to allow here for any further expense entailed in waiting upon special tradesmen, or for the disturbance of his work caused by them, and for giving them all facilities for the execution of their work."

Care should be taken that the nature of the attendance which will be afforded them is clearly set out in the sub-contractors' contracts.

It is considered inadvisable in ordinary circumstances to make money provisions to be expended in "day work."

The council of the society, after careful consideration of the memorandum, found themselves able to approve in principle the recommendations of the Sur-

The Surveyor

And Municipal and County Engineer.

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veyors' Institution, but made suggestions for alterations in detail, more particularly in regard to descriptive items, summarised in the cases of sub-contract of minor importance, and set out in full on works of importance.

They also suggested the following additional clause:—

"The words 'attended upon' or 'attendance' do not comprise any works of construction—*e.g.*, pipe trenches, castings, &c.—but they do comprise all cutting away and making good after receiving materials and providing storage space for them, providing water and allowing the use of erected scaffolding and fixed plant. Where the sub-contractor does not allow in his tender for any special scaffolding that may be required in connection with his work, the general contractor must provide it. The words 'attend upon' or 'attendance' must also be taken as so provided in the contract) to cover the payment of accounts as certified by the architect, before their inclusion in the general contractor's certificates."

The council of the Surveyors' Institution agreed that the verbal alteration suggested would be an improvement; but with respect to the provision of special scaffolding, they considered that this could not be taken as included in the general term "attendance," and should be the subject of a separate item.

On further consideration the council of the society agreed to this, and subsequently the council of the Surveyors' Institution, in thanking the council of the society for the interest they had shown in the matter, intimated that their committee would take advantage of the suggestion made by the society when re-issuing the circular on attendances on sub-contractors.

Meanwhile they express a hope that the members of the Society of Architects may support the Quantity Surveyors in carrying out the principles embodied in the memorandum.

London Electricity Supply.—In the current issue of the *Electrician* appears the first instalment of a memorandum by Mr. P. D. Leake, F.C.A., on the financial proposals of the Electricity Committee of the London County Council regarding London electricity supply, which is of special interest now that schemes for the supply of electricity on a huge scale are so much under discussion. The paper clearly sets forth a practical means for keeping a close connection between the existing condition of electrical plant which is so apt to become antiquated and to lose its value before it is worn out—and the provision made out of revenue to answer expired capital outlay. Unless this provision is adequate, the capital value of the undertaking cannot be maintained.

CORRESPONDENCE.

RECENT CIRCUMSTANCES AFFECTING ROADS.

To the Editor of THE SURVEYOR.

SIR,—I have read the letter of the secretary of the Roads Improvement Association with surprise. I had heard of some bituminous roads in various parts of the country which were proving unsatisfactory, but was unaware that there was an all-round failure, and that "these weather conditions have affected nearly everyone alike."

This letter would indicate an underlying opinion that "bituminous" roads are proving unsatisfactory, and as I have taken a prominent part in the study and promotion of this form of construction I make no apology for [illegible] which is backed up by personal experience—*e.g.*, the bituminous or other paving in my district under all kinds of traffic has not, so far as one can see, in any way deteriorated, notwithstanding the weather; and, further, this form of construction has been carried out during the autumn, and is being laid at the present time without any unsatisfactory results.

With reference to failures elsewhere, are some of these not to be anticipated? I have on various occasions pointed out that there is an element of danger in the use of oil residual bitumens, and have also expressed the opinion that [illegible] than a well-prepared tar. Are not the defects frequently blinded by the use of that elusive word "bitumen," which is sometimes termed "pure bitumen" and "asphalt"?

Then there is an important element which is also overlooked—viz., the composition of the aggregate. A [illegible] which will fail if the aggregate has been badly designed; this would be much worse if the "bitumen" lacks proper qualities. In much the same manner, concrete may fail, not necessarily because the cement is inferior, but because the stone, &c., is badly proportioned.

Bituminous road construction must be carefully studied; it is not a simple process, especially in this country with its excessively humid atmosphere in the cold periods of the year, and if the bitumen employed has not the power to resist cumulative hardening, emulsification, or if it contracts too severely under the temperatures prevailing, then failure in some degree must be anticipated.

It will probably be found that where failures have resulted it will have been due to the use of an unsatisfactory "bitumen," careless handling, or indifferent design of the composition, all of which can be controlled, and therefore failures should only in exceptional cases be put down to the weather.—Yours, &c.,

FRANCIS WOOD,
Borough Engineer and Surveyor.

Fulham, S.W.
February 26, 1915.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

EASTERN DISTRICT.

An Eastern District meeting will be held at the offices of the Institution, 92 Victoria-street, Westminster, S.W., on Saturday, 13th March.

4 p.m.—Meeting of Executive Committee.

AGENDA.

(1) To consider annual report.
(2) Suggestions for arrangements of future meetings.

4.30 p.m.—Meeting of the members of the Eastern District.

AGENDA.

(1) Minutes of previous meeting held at Tilbury.
(2) Election of Executive Committee.
(3) Election of Chairman.
(4) Election of district representatives.
(5) Election of honorary secretary.
(6) Suggestions as to arrangements for future meetings.
(7) A discussion on the use of bituminous material in road construction.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, assoc.m.inst.c.e.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

The premium for February is awarded to

Mr. F. J. Manning,
Borough Surveyor's Office,
Luton,

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

459. Sewage Sprinkler.—Describe an efficient form of sewage sprinkler for percolating filters which requires very little head of sewage to work it. (J. R. H., *Ipswich.*)

460. Sewage Sea Outfall.—Are reinforced-concrete pipes better than cast-iron pipes for a sewage outlet into the sea, which is covered at high water? Compare them as regards initial expense and maintenance. (J. R. H., *Ipswich.*)

463. Bomb-proof Dug-out.—Give sketches of a bomb-proof dug-out to hold five people. (Tico.)

464. Masonry Arch.—State three ways in which a masonry arch may fail, and describe the cause of each. (J. F., *Fadiham.*)

465. Girder Design.—What are the main points to be borne in mind when determining for a given purpose: (*a*) Type of girder; (*b*) proportions of girder (depth and width, &c.); (*c*) material to be employed (steel, wrought iron, or reinforced concrete). (M. T. R., *Ithyl.*)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

462. Projectiles.—Establish a formula for determining the angle at which a projectile should be discharged to secure the maximum range. (T. R.)

The following more complete reply to this question has been received since our last issue:—

Consider a projectile having an initial velocity V in a direction making an angle α with the horizontal. Let the co-ordinates of any point P on the trajectory be denoted by (x,y) where x is measured horizontally from the initial position, and y is the vertical height of the projectile above the ground.

Neglect air resistance, and resolving V into a vertical velocity of V sin α and a horizontal velocity V cos α. The horizontal velocity is uniform, and the vertical velocity variable owing to the attraction of gravity (g = 32.2 ft./sec.^{2}).

After t seconds the projectile will have travelled a distance $= V t \cos\alpha$ horizontally . . . . . (*a*)
and a distance $= V t \sin\alpha - \frac{1}{2} g t^2$ . . . . . (*b*)
vertically (using formula $s = ut + \frac{1}{2} f t^2$ for a falling body)

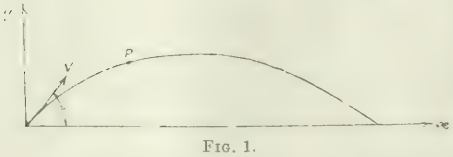

Fig. 1.

The equation of the trajectory is obtained by substituting the value of t from equation (*a*) in equation (*b*).

$$\therefore y = x\left(\tan\alpha - \frac{g x}{2 V^2 \cos^2\alpha}\right) \quad . \quad . \quad . \quad . \quad . \quad (c)$$

which is a parabola.

The range is given by substituting $y = 0$ in (*c*) which gives $x = \frac{2 V^2 \sin\alpha \cos\alpha}{g} = \frac{V^2 \sin 2\alpha}{g}$ for the range.

This is a maximum when $\sin 2\alpha = 1$—*i.e.*, when $\alpha = 45°$.

In the case of the range on an inclined plane, making an angle β with the horizon, we can calculate the position of the point at which the projectile meets the ground. (See figure 2.)

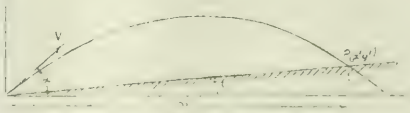

Fig. 2.

The projectile describes the same trajectory, but meets the plane at a point P co-ordinates (x^1, y^1). This position is given by $y^1 = x^1 \tan\beta$, and equation (*c*)

$$y^1 = x^1\left(\tan\alpha - \frac{g x^1}{2 V^2 \cos^2\alpha}\right).$$

$$\therefore x^1 \tan\beta = x^1\left(\tan\alpha - \frac{g x^1}{2 V^2 \cos^2\alpha}\right) \text{ from which } x^1 = \frac{2 V^2 \cos^2\alpha}{g}(\tan\alpha - \tan\beta) = \frac{2 V^2}{g}(\sin\alpha\cos\alpha - \tan\beta\cos^2\alpha)$$

$$= \frac{2 V^2}{g} \frac{\cos\alpha}{\cos\beta} \sin(\alpha - \beta).$$

The range $R = \frac{x^1}{\cos\beta} = \frac{2 V^2}{g} \frac{\cos\alpha}{\cos^2\beta} \sin(\alpha - \beta)$.

For a maximum the differential coefficient of R with respect to α is equated to zero—

i.e., $\frac{d R}{d\alpha} = \frac{2 V^2}{g \cos^2\beta}(\cos\alpha\cos(\alpha-\beta) - \sin(\alpha-\beta)\sin\alpha) = 0$.

$\therefore \cos\alpha\cos(\alpha-\beta) - \sin(\alpha-\beta)\sin\alpha = 0$.

$\therefore \cos(2\alpha-\beta) = 0$.

$\therefore 2\alpha - \beta = \frac{\pi}{2}$ or $\alpha = \frac{1}{2}\left(\frac{\pi}{2} + \beta\right)$.

The angle the projectile makes with the vertical is $\frac{\pi}{2} - \alpha = \frac{1}{2}\left(\frac{\pi}{2} - \beta\right)$.

Therefore for a maximum range on an inclined plane the direction of projectile should bisect the angle between the inclined plane and the vertical. In the above solution the air resistance is neglected. (W. R. H., *Fulham.*)

461. Applied Mathematics.—Give some simple examples of the application of the calculus to the solution of practical engineering problems. (Student.)

Example No. 1.—To find the moment of inertia of a rectangular lamina about an axis (XX) through

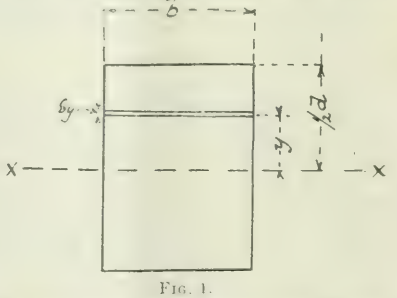

Fig. 4.

the centre of gravity by application of the calculus. Suppose the lamina ABCD in Fig. 4 be divided up

into a large number of very narrow strips of width b and depth dx. Now by a well known theorem the moment of inertia of one of these strips about the axis (XX) in Fig. 2 is

(Moment of inertia about an axis parallel to XX passing through centre of gravity of strip) + (Area of strip × distance from C of neutral axis to the centre of gravity of strip)^2

$$= \frac{b\,dx^3}{12} + b\,dx\,x^2$$

Now, in the above expression the first term is very small when the depths of strips is very large, and when the number of strips is infinite the term $= 0$. So we can write

Moment of inertia of section = sum of moments of inertia of the strips

$$= 2\sum b\,dx\,x^2$$

$$= 2\int_0^{\frac{d}{2}} b\,dx\,x^2$$

But b is constant

$$\therefore \text{Moment of inertia} = 2\int_0^{\frac{d}{2}} b\,dx\,x^2$$

$$= 2b\left[\frac{x^3}{3}\right]$$

$$= 2\times\frac{bd^3}{24}$$

$$= \frac{bd^3}{12}$$

Example No. 1.—Find the economic depth for a rolled steel joist.

Let M = maximum bending moment to be resisted in lb. inches.

d = depth of joist in inches.

F = working stress in tension in lb. per sq. inch.

t = thickness of web in inches.

l = length of joist in inches.

w = weight of steel per cubic inch in lb.

Now,

Weight of 1 flange = $\frac{\text{total stress in flange}}{\text{stress per sq. inch}} \times \text{length} \times \text{weight per cubic inch}$

$$= \frac{M}{\frac{d}{2}F} \times l \times w$$

$$= \frac{2M}{dF} lw$$

Weight of 2 flanges $= \frac{4M}{dF} lw$

Weight of web $= tdlw$

Weight of joist $= \frac{4M}{dF} lw + tdlw$

$$= \left(\frac{4M}{dF} + td\right) lw$$

Differentiate this expression with respect to the depth and we get derivative $= lw\left[t - \frac{2M}{Fd^2}\right]$

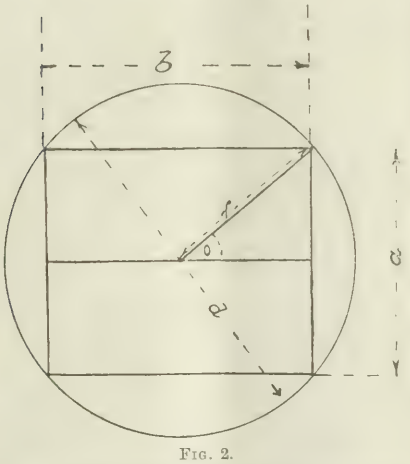

FIG. 2.

For a maximum the derivative must be equated to zero, to obtain the condition

$$\text{i.e., } t = \frac{2M}{Fd^2}$$

$$\text{or } d^2 = \frac{2M}{Ft}$$

$$d = \sqrt{\frac{2M}{Ft}}$$

The [illegible] gives the depth of joist.

Example No. 2.—The strength of a rectangular beam varies as the product of the breadth and the square of the depth; find the breadth and depth of the strongest rectangular beam that can be cut from a cylindrical log whose diameter = d inches.

Refer to Fig. No. 2.

The section of the beam varies as the angle θ varies.

Let r be the radius of the log in section.

Breadth of beam $= 2r\cos\theta$

Depth of beam $= 2r\sin\theta$

Strength of beam is proportional to (breadth) × (depth)^2

$$= 2r\cos\theta \times 4r^2\sin^2\theta$$

$$= S = 8r^3\cos\theta\sin^2\theta$$

We now differentiate and get

$$S = 8r^3\left[\cos\theta\frac{d\sin^2\theta}{d\theta} + \sin^2\theta\frac{d\cos\theta}{d\theta}\right]$$

$$S = 8r^3[2\sin\theta\cos^2\theta - \sin^3\theta]$$

$$S = 8r^3[2\cos^2\theta\sin\theta - \sin^3\theta]$$

For a maximum $S = 0$

$$\therefore 2\cos^2\theta = \sin^2\theta \quad \ldots\ldots\ldots (1)$$

But $\cos\theta = \frac{b}{d}$ $\therefore \cos^2\theta = \frac{b^2}{d^2}$

and $\sin\theta = \frac{h}{d}$ $\therefore \sin^2\theta = \frac{h^2}{d^2}$

From equation (1) $\frac{2b^2}{d^2} = \frac{h^2}{d^2}$

$$\therefore h^2 = 2b^2 \quad \ldots\ldots\ldots (2)$$

But $\left(\frac{d}{2}\right)^2 = \left(\frac{b}{2}\right)^2 + \left(\frac{h}{2}\right)^2$

$$\therefore d^2 = b^2 + h^2$$

By substituting from (2)

$$d^2 = 2b^2 + b^2$$

$$\therefore b = \frac{d}{\sqrt{3}}$$

and $h = \sqrt{\frac{2}{3}}\,d$

So that breadth of strongest beam is $\frac{d}{\sqrt{3}}$

and depth $\quad\ldots\quad\ldots\quad \frac{\sqrt{2}}{\sqrt{3}}\,d$

(M. T. R., *Khyber*.)

INSTITUTION OF MUNICIPAL ENGINEERS.

COUNCIL MEETING.

At a meeting of the council held in London on February 26th the following applicants were recommended for admission:

To Membership: Mr. E. J. Miles, deputy borough engineer, W. Hartlepool.

To Associate-membership: Messrs. K. G. Foster, chief assistant, Chelmsford Rural District Council, and A. Skinner, chief assistant, Beverley Borough Council.

Elected to Studentship: Mr. I. C. Jenkins, surveyor's office, Abersychan Urban District Council.

Mutual Aid Fund.—The council had under consideration the application from a certain member, but were of the opinion that the case was not one for the fund. At the same time, after a lengthy discussion of the matter, they tendered the member in question certain advice.

Arrears.—The secretary was instructed to furnish the various district secretaries with a detailed statement of arrears due from members in their district.

Council Meetings.—Mr. Horace Boot gave notice that at the next meeting of the council he would move that the London council meetings be held on the last Wednesday in each month instead of the last Friday, and that the time of the meeting be 5.30.

The next meeting of the council will be held in London on Friday, March 26th.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Bedwas and Machen U.D.C. (February 26th. Mr. H. Shelford Badwell). £2,150 for works of water supply in the Machen Ward.—It is proposed to construct water mains from Trethomas to Machen, the council having secured a three years' agreement with the Rhymney and Aber Gas and Water Company for a supply of water in bulk. The minimum quantity of water to be supplied is 10,000 gallons per day, and the maximum is not to exceed 40,000 gallons per day.

Coleraine U.D.C. (February 25th. Mr. P. C. Cowan). £1,000 for the construction of a covered concrete tank in connection with the waterworks reservoir at Ballyversal.—The surveyor, Mr. W. J. Given, said he estimated the cost of the proposed tank at £911. The tank would have a capacity of 180,000 gallons. Messrs. Swiney & Croasdaile, engineers, Belfast, recommended this tank or an alternative scheme at £4,000. The inspector said that in Newtownards they had been troubled with impure water through storage in the open, and after the construction of a covered tank the trouble disappeared. The council, he noticed, was in a very happy position financially. They paid strict attention to domestic scavenging—a very important work. He was sure this would tend to a reduction in disease.

Killarney U.D.C. (February 22nd. Mr. A. W. Price).—£1,500 for the purchase of materials for road improvement, and £370 for the purchase of materials for sewerage works.—It was stated that the cost of the labour would be met by a grant from the National Relief Fund.

Lisburn U.D.C. (March 1st. Mr. P. C. Cowan). —This was an inquiry into the application for a Provisional Order enabling the council to acquire, otherwise than by agreement, certain lands for the purpose of extending the water supply of the urban district. At the same time the council applied for sanction to the borrowing of £6,000. Evidence in support of the proposed extension of the water supply was given by Mr. Norman McLean and Mr. J. E. Croasdaile, of Messrs. Swiney & Croasdaile, consulting engineers.

Mansfield T.C. (March 2nd. Mr. P. M. Crosthwaite). —£1,300 and £975 for works of sewerage in Chesterfield-road, and sewerage and sewage disposal at Pleasley Hill.—On Chesterfield-road the existing sewer was laid thirty years ago, and as it has become insufficient, it is proposed to lay a new 36-in. sewer 450 yds. in length. The extension will drain an area of 200 acres. Regarding the Pleasley Hill loan, the works were originally constructed fifteen or sixteen years ago, and, owing to the growth of the population, they have now become inadequate, and an extension is necessary.

Paignton U.D.C. (February 27th. Mr. W. O. E. Meade-King).—£920 for the widening of Preston Sands-lane.—The surveyor, Mr. C. Owen Baines, said it was proposed to set back a corner 26 ft. and make the general width 60 ft. wide.

Prudhoe U.D.C. (February 23rd. Mr. C. H. Eyles). £6,000 for the purchase of land and the erection of workmen's houses.—The site consists of 8 acres at Edgewell, where the council propose to build thirty houses, of which plans were submitted.

St. Germans R.D.C. (February 26th. Mr. W. O. E. Meade-King). £900 for sewerage and sewage disposal works for the parish of Crafthole.—The clerk, Mr. F. E. Cleverton, said it was proposed to conduct the sewage in 7-in. stoneware socket pipes, cement jointed, to a point below the reservoir of the Torpoint Urban District Council. Here the sewage was to be treated by triple contact, two sets of beds being provided. The outfall was to be to an existing sewer or drain which emptied into a natural stream not far above its junction with the salt water of the estuary. The existing sewer or drain at present conveyed the drainage of a farm. The sanitary inspector, Mr. P. B. Govett, said a few of the houses in the village were without drainage. Mr. R. H. Worth is engineer of the scheme.

APPLICATIONS FOR LOANS.

Bexley U.D.C. £800 for the extension of the recreation ground.

Chertsey R.D.C.—£1,782 for additions to the sewage pumping plant.

Croydon T.C. £4,000 for road widenings.

Godstone R.D.C. £3,500 for new council offices.

Hendon U.D.C. £591 for the construction of roads.

Linthwaite U.D.C. £1,900 for the Hoyclouse improvement scheme.

Llandudno U.D.C.—£1,720 for electrical plant.

Meriden R.D.C. £3,820 for sewerage and sewage disposal works at Fillongley.

Newton Abbot R.D.C. £900 for the purchase of land for a housing scheme.

Southgate U.D.C.—£11,795 for laying wood paving and bituminised granite.

Stoke-on-Trent T.C.—£1,499 for road widening.

LOANS SANCTIONED.

Devonport T.C.—£10,240 for a new school.

Finchley U.D.C.—£2,500 for a disinfectant station, £300 for a cottage, £610 for air compressing plant, and £760 for humus tanks.

Godstone R.D.C.—£455 for the purchase of land at Warlingham for sewage disposal.

Hendon U.D.C.—£9,986 for sewerage works in Dollis Valley.

Lancaster T.C.—£1,000 for the enlargement of the isolation hospital.

Llandudno U.D.C.—£1,225 for laying out public golf links.

Rochdale T.C.—£5,570 for sewerage works.

Southgate U.D.C.—£1,400 for Broomfield Park improvements.

Surrey C.C.—£1,397 for the extension of Epsom technical school.

Wednesbury T.C.—£2,146 for a new electricity transformer station and plant.

Withernsea U.D.C.—£7,500 for the South Cliff sea-wall scheme.

FORTHCOMING INQUIRIES.

MARCH.	£
8.—**Bollington.** For works of paving (Mr. R. H. Bicknell)	8,635
8.—**Mansfield.** For the provision of houses (Mr. H. A. Chapman)	7,400
9.—**East Stow.** For works of water supply (Mr. A. C. Drury) ...	2,747
9.—**Plymouth.** For road improvement (Mr. W. O. E. Meade-King) ...	12,976
9. **Wednesbury.** For the provision of houses (Mr. H. A. Chapman)	5,240
10.—**Flint.** For the provision of a depot (Mr. F. O. Stanford)	200
10.—**Hendon.** For works of sewerage (Mr. A. C. Drury) ...	1,675
10.—**Oswaldwistle.** For private street improvement (Mr. R. H. Bicknell) ...	1,550
10. **Pinner.** For works of sewerage (Major J. Stewart) ...	600
11. **Colwyn Bay.** For the purposes of electricity and a refuse destructor (Mr. F. O. Stanford) ...	35,040
11. **Highbridge.** For cemetery enlargement (Mr. W. O. E. Meade-King) ...	—
11. **Shaftesbury.** For the provision of houses (Mr. H. A. Chapman) ...	5,000
11. **Wincanton.** For works of water supply (Mr. W. O. E. Meade-King)	1,900
12.—**Southampton.** For road improvement (Mr. W. O. E. Meade-King) ...	1,700
12. **Twrcelyn.** For works of sewage disposal (Mr. F. O. Stanford) ...	2,500
12.—**Waterbeach.** For burial ground extension (Mr. F. H. Tulloch) ...	—
12.—**Watford.** For private street improvement (Mr. M. K. North) ...	6,729
12.—**Wycombe.** For the provision of houses (Mr. Courtenay Clifton)	1,250
16.—**Luton.** For hospital extension (Dr. A. S. MacNalty) ...	5,320

Approved Sanatoria.—The Local Government Board have issued a revised list of sanatoria approved by them under the National Insurance Act, 1911, for England and Wales, and copies of the list (price 1d.) have been forwarded to interested authorities.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below:—Buildings, Essex Godstone, housing and town planning, Dublin, Newcastle-on-Tyne, Swansea; roads and materials, Harrow; sewerage and sewage disposal, Chipping Norton, Lambeth, Stafford; water, gas and electricity—Cleckheaton, Dover, Hull.—Particulars of other projected works will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Blackpool T.C.—The Health and Cleansing Committee have adopted the recommendation of the borough surveyor, Mr. J. S. Brocklebank, for a consumptive sanatorium at Staining, and these will be forwarded to the Local Government Board in due course for approval.

Chesterfield T.C.—The Board of Education have approved the plans of the Education Committee for the erection of a school in Saltergate.

Claypole R.D.C.—The surveyor, Mr. P. A. Watford, has received instructions to prepare plans for an isolation hospital.

Colne T.C.—Repairs are to be carried out at the municipal hall and public library, and the borough surveyor, Mr. T. H. Hartley, has been instructed to prepare plans for an additional exit to the municipal hall.

Coventry T.C.—The city council recently passed a vote of £400 for the provision of stained glass in certain windows of the council house in course of erection. Mr. W. H. Grant, who submitted the proposition, stated that the proposed windows were part of a scheme of heraldic decoration, and in this connection he quoted a saying of Ruskin's: "Better the rudest work that tells a story or records a fact than the richest without meaning. There should not be a single ornament put upon great civic buildings without some intellectual intention." He said the original scheme was to show in stone something of the growth, development and history of the city—a story that in legend and written records went back 1,000 years. The figures to be carved for the outside of the new municipal buildings formed a procession of kings and queens, priests and prelates, knights and earls, benefactors, and other citizens. The general scheme of heraldry for the exterior embraced thirty-six shields or blazons. In the two windows proposed for approval the Weavers' and Skinners' Companies were to be celebrated, and he believed if the scheme were carried out Coventry would have one of the finest examples in Great Britain of civic buildings expressing in blazons the story of its growth.

Essex C.C.—Revised plans have been prepared for the extension of the council school at Dunmow, the cost of which is estimated at £2,396.

Godstone R.D.C.—The plans of Mr. Streatfield for the proposed new offices have been approved by the council. The estimated cost of the building, including furniture and fittings, is £2,900.

Hendon R.D.C.—It has been decided to erect an additional ward at the isolation hospital, at an estimated cost of £200.

Hythe T.C.—It has been agreed to construct four additional groynes at an estimated cost of £1,580.

Maidstone T.C.—Negotiations have been completed for the purchase of a site for a small-pox hospital.

Manchester T.C.—The council on Wednesday decided not to proceed with the building of four public washhouses (at a cost of £16,000) and twenty-one tennis courts at various public parks (at a cost of £2,050). With respect to these projects Alderman Copeland, chairman of the Finance Committee, stated that the Treasury will not at present sanction the raising of fresh capital for new expenditure.

Middlesex C.C.—At the next meeting the council will reconsider their decision to postpone the erection of the proposed sanatorium for the treatment of tuberculosis, the Local Government Board having submitted to them reasons why, in the board's opinion, delay is undesirable.

Newbury T.C.—An estimate has been approved, at £350, for a manual instruction annexe at the council school.

Twickenham U.D.C.—The surveyor, Mr. F. W. Pearce, has been asked to prepare plans for the provision of additional accommodation at the isolation hospital at Whitton, and to obtain estimates for permanent and, alternatively, temporary buildings. The latter arose out of a suggestion by a medical member who contemplated the burning down of the buildings after twenty years' use, as by that time they became saturated with microbes.

Wandsworth B.C.—The council have adopted a recommendation of the Highways Committee asking the county council to construct a tramway shelter with lavatory accommodation at the triangular portion of Clapham Common, at the junction of The Avenue with South Side. Permanent refuges are to be placed in Tooting Bec-road and Trinity-road at their junction with Balham High-road.

HOUSING AND TOWN PLANNING.

Balbriggan U.D.C.—The Local Government Board have approved the council's scheme for the erection of thirty workmen's cottages, at an estimated cost of £7,000.

Carlisle T.C.—A scheme has been approved by the Health Committee for the erection of thirty-six houses—twenty-four upon one site and twelve upon another.

Dublin T.C.—It was decided on Monday to carry out a housing scheme on the McCaffrey estate, at an estimated cost of £36,030. The houses will be let at 7s. a week.

Glyncorrwg U.D.C.—The surveyor, Mr. W. P. Jones, has been instructed to prepare plans for two housing schemes.

Kirkcaldy T.C.—The burgh surveyor and sanitary inspector have prepared a report on their visits of inspection to various places where housing schemes are in operation.

Mutford and Lothingland R.D.C.—The Assistant secretary of the Local Government Board has written informing the council that it was a matter for the Local Government Board to decide whether any charge in connection with houses to be built in the district should be a charge on the district or parish, and stating that any application for a declaration under sec. 39 (1) of the Act of 1909 should be accompanied by a full statement of the grounds on which the application is made, and by full particulars of the housing scheme proposed to be carried out, and, further, that the board would only consider such an application in connection with a definite scheme.

Newcastle-on-Tyne T.C.—At an estimated cost of £117,781, the Housing Committee have agreed to proceed with the scheme for erecting 688 houses on a site in the vicinity of Walker Park.

Swansea T.C.—In consequence of the prices for building being in excess of the council's estimates it has been resolved to allot a contract for the erection of 150 houses of the 500 houses it is proposed to build, with a condition that the basis of prices might be reconsidered under more favourable financial circumstances.

REFUSE COLLECTION AND DISPOSAL.

Rochdale T.C.—A scheme has been approved by the Cleansing Committee for adapting the tramway depot in Entwistle-road for cleansing purposes, at an estimated cost of £700.

ROADS AND MATERIALS.

Axbridge R.D.C.—The council have agreed to carry out a scheme of the surveyor, Mr. J. Lovell, for working the quarry at Crosse. The proposal is to lay a tramway and haul the trucks by means of a wire rope, the weight of the loaded trucks to pull up the empty ones. The estimated cost of the scheme is £225, and it was stated that it will result in a saving of £100 a year.—A grant of £388 has been sanctioned by the Road Board in aid of the East Brent-road improvement scheme, and the council will borrow £1,000 to meet the rest of the cost.

Axholme R.D.C.—The surveyor, Mr. B. West, has received instructions to prepare a statement with a view to application being made to the Road Board, through the county council, for a substantial grant

towards the cost of adapting to the new traffic the road selected for the route to Keadby Bridge.

Barnstaple R.D.C.—The council have referred to the General Purposes Committee a letter received from the Bridges and Main Roads Committee of Devon County Council, expressing the opinion that with 118 miles of main roads and 426 miles of district roads to look after, it was impossible for the district surveyor (Mr. A. A. Richards) to supervise the work properly. They considered the district should therefore be divided into two, and two surveyors appointed.

Chelmsford T.C.—New road works are to be carried out at an estimated cost of £1,489.

Cheltenham R.D.C.—The council have approved a proposition of the surveyor, Mr. C. Beynon, with respect to the purchase of local stone. The present method of purchase is by the load, in which there is no sufficient uniformity of weight, and Mr. Beynon suggested that in future the stone should be yarded and measured, which would entail a cost of about £10 per annum, but would ensure that the council got the quantity of stone paid for, and would be more satisfactory to all parties. It was resolved to insert in all contracts a clause that the contractor is to stack such stone at 2d. per yard.

Cuckfield R.D.C.—The highway surveyor, Mr. A. Macarthur, reported that the London Granite Company could not accede to the council's proposals for the substitution of Groby (Leicester) granite for the balance of Quenast granite due on the current year's contract, and in consequence he had placed orders for equal quantities in the hands of the Groby Granite Company and the Mountsorrel Granite Company for the supply of the 700 tons due at prices as quoted in tenders for the ensuing season's supplies of materials.

Hampton Wick U.D.C.—The surveyor, Mr. P. Taylor, was on Monday authorised to purchase 3,000 gallons of special tar from Messrs. E. Catchpole & Sons, at 4d. per gallon, for the main roads, and 150 yds. of shingle from the Ham River Grit Company, at 6s. 6d. per yard, for the other roads.

Hornsey T.C.—The borough surveyor, Mr. E. J. Lovegrove, recently called attention to the necessity for repairing considerable lengths of footways, and the Finance Committee were requested to provide "as large an amount as possible" to meet the cost of the work.

Leyburn R.D.C.—The Highways Committee have been asked to consider the questions of employing a permanent staff on the roads, and the purchase of a steam roller.

Macclesfield T.C.—A portion of Barracks-lane is to be made up according to plans prepared by the borough surveyor, Mr. S. C. Baggott.

Walsall T.C.—The borough surveyor, Mr. John Taylor, in his annual report, states that there have been thirteen workmen in his department who have joined the military forces, and twelve horses and eight vehicles have been impressed into the service. It is becoming increasingly difficult, he states, to keep the roads in an efficient state of repair, not only as a result of increased traffic, but owing to the motors, which caused exceptional wear and tear. Moreover, the Road Board had discontinued all grants since the outbreak of war.

Wilton T.C.—The council have forwarded the plans of the borough surveyor, Mr. G. Cole, for a series of street improvements estimated to cost £5,171, with a request for a grant in aid of the works.

Woolwich B.C.—In July last the London County Council decided to undertake the widening of High-street, Eltham, and Eltham-road, at an estimated nett cost of £53,000. The execution of the scheme necessitates the acquisition of certain strips of land forming part of the Crown estates. The Crown authorities desire that the land not taken for the purpose of the improvement should be properly fenced off, and, in connection therewith, they are willing to surrender sufficient land to make a footpath on the south side of Eltham-road for the length in question, of a uniform width of 12 ft. This addition to the public way, in the opinion of the council, is very desirable, and steps have been taken to amend the scheme accordingly.

SEWERAGE AND SEWAGE DISPOSAL.

Bexhill T.C. Application has been made to the Board of Trade for permission to lay a 15-in. surface-water drain and storm-water relief sewer, extending about 210 ft. below high-water mark, under and on the foreshore opposite Cooden Sea-road, Bexhill.

Billericay R.D.C.—The council have instructed Messrs. Willcox & Raikes to prepare plans for sewerage extensions.

Chertsey R.D.C.—The council have agreed to the proposals of the surveyor, Mr. H. Beeney, for additions to the plant at the sewage pumping station. These include the provision of a new 20-h.p. gas engine, air compressor, gas generating plant, and the removal of one of the existing centrifugal plants to new buildings. The estimated cost is £1,782.

Chipping Norton R.D.C.—A sewage disposal scheme for Charlbury is under consideration. The estimated cost is £4,000.

East Barnet U.D.C.—A letter has been received from the Lee Conservancy Board stating that they had had before them a report by their chemist upon his analysis of a sample of the effluent from the sewage farm to Pymmes Brook from which it appeared that the effluent was in an unsatisfactory condition, and requesting that immediate steps should be taken to remedy the state of affairs. The report of the council's chemist upon a sample taken at the same time, which stated that the effluent was an excellent one, was read. In the circumstances the council have asked the conservancy board to state in what respects the sample is considered by their chemist to be unsatisfactory.—The surveyor, Mr. H. York, has received instructions to prepare an estimate for a small humus tank and an additional settling tank.

Lambeth B.C.—It is proposed to reconstruct the sewer from Water-lane to the borough boundary, Brixton-hill, at an estimated cost of £14,450.

St. Austell R.D.C.—The surveyor, Mr. W. H. Moffatt, has received instructions to prepare a drainage scheme for Sandy Bottoms, part of Bethel, and Grampound.

Stafford T.C.—The Public Health Committee have submitted to the council a proposal for an improved system of sewage disposal, the cost of which is estimated at £19,000.

Stockton R.D.C.—The plans of the sanitary surveyor, Mr. W. J. Rodham, for a sewerage scheme for Wolviston have been approved.

Southwick (Sussex) U.D.C.—A favourable report was submitted on Monday as to the benefit derived from the new surface-water drain, which was meeting every contingency. Mr. Flinn said he thought the surveyor, Mr. G. W. Warr, and the council were to be congratulated on the success of the scheme, especially after the criticism which had been experienced.

Swanage U.D.C.—The surveyor, Mr. W. H. Pearce, has reported to the Works Committee that he had met Mr. Commin, the sanitary engineer for the military camps, who had informed him that it was proposed to connect to the Ulwell sewer by a 6-in. pipe, following, approximately, the line of the Ulwell stream. The surveyor requested him to submit an alternative estimate showing the increased cost of putting in a 9-in. pipe in Ulwell-road. With regard to Godlingston camps, Mr. Commin said he was endeavouring to get the War Office to sanction a sand filter scheme as distinct from draining into Victoria-avenue.

Wirral R.D.C.—The council have accepted the tender of Mr. Charles L. Warren, at £1,900, for the Willaston and Eastham drainage scheme.

Worcester T.C. The council on Tuesday considered the sewage-filtration difficulty. While the sewage can come under treatment satisfactorily the filter beds have become sealed, and to this question of filtration considerable attention has of late been given, expert advice sought, and visits paid to other works, including those at Coleshill and the main works at Saltley. At each of these a deputation paid special attention to the treatment of sludge. A visit was also paid to Salford. Last month the Local Government Board sent a letter to the council, and this was considered by the Sewerage Committee, who recommended that the board be informed that the council had abandoned the idea of dealing with the sewage by means of upward filtration, that a copy of a report by the city engineer, Mr. T. Cainik, be forwarded to the board, and they be told the committee were asking the council to make a trial of steps recommended by the city engineer for washing the surface of the filters so as to facilitate their working. This recommendation the council approved, the estimated cost being £200.

Wortley R.D.C.—The council recently decided to proceed at once with a scheme for the drainage of Charlton Brook, Chapeltown. The project had been debated by the council for nearly ten years. The Local Government Board is to be asked to sanction a loan of £1,500 for the purpose, and a loan to cover the repayment of £700 wayleaves, and the capital cost of improving and extending the Chapeltown sewage works.

WATER, GAS, AND ELECTRICITY.

Belleek (Ireland) R.D.C.—An intimation has been received from the Local Government Board that, as no objections had been received, they proposed to issue an order investing the council with the powers of an urban sanitary authority for the purpose of carrying out the scheme of lighting by electricity.

Cleckheaton U.D.C.—A scheme is proposed for the extension of the electricity undertaking, at an estimated cost of £20,000.

Dover T.C.—The Electricity Committee have adopted a scheme for new electricity plant at an estimated cost of £6,000.

Evesham R.D.C.—The council on Monday accepted a tender, at £1,949, for carrying out the Harvington water scheme. This does not include the work in connection with the crossing of the river. The engineer's estimate for the work, including the river crossing, was £2,195, and the loan was for £2,500, including easements.

Halifax T.C.—The Electricity Committee propose to spend £5,000 upon new electricity mains.

Hull T.C.—The Electricity Committee have approved a scheme of plant extension, which will cost £41,500. The chairman, Alderman Hanger, stated that the cost of the extensions would not fall upon the rates.

Ripon T.C.—Colonel Ellis, representing the War Office at Ripon, has written stating that the maximum quantity of water to be taken from the Lumley Moor and Roundhill reservoirs for the military camp would be 300,000 gallons per twenty-four hours. He agreed on behalf of the War Office to the increased estimate of £2,238 as stated by Mr. Dixon, the engineer, for alterations at Lumley Moor, and to an annual charge of £100 for labour. He also agreed that the supply of water for the camp should not prejudice the corporation's supply of water for the city in regard to pressure or quality.

MISCELLANEOUS.

Hampton Wick U.D.C.—Of two tenders, that of Mr. J. Downs, a local contractor, has been accepted for a year at 9s. per day for general cartage, 2s. 6d. per yard for drawing from the wharf, and £180 for the removal of house refuse.

Limerick C.C.—At a meeting of the council on Saturday it was unanimously decided that the surveyors should each be advanced a loan of £100 to buy motor cars, and allowed 5d. a mile allowance for the running of the vehicles.

PRO PATRIA.

[TWENTY-FIRST LIST.]

We present herewith the twenty-first list of municipal engineering and sanitary officials who are taking part in the war, and shall be glad to hear of other cases within the knowledge of our readers.

Alderson, F., assistant surveyor to the Romford Rural District Council, Royal Engineers.

Cheaseman, F. C., borough engineer's office, Southwark, 16th (County of London) Battalion, Queen's Westminster Rifles.

Collins, W. R., engineering assistant, Enfield Urban District Council, Lieutenant, City of London Regiment, Royal Fusiliers.

Dent, G. E., clerk, Darlington borough engineer's department, bombardier, Royal Field Artillery, No. 1 Depot, Newcastle-on-Tyne.

Maynard, C. E., second assistant, surveyor's department, Romford Rural District Council, Second Lieutenant, Oxford and Bucks Light Infantry.

Page, J., junior assistant, surveyor's department, Romford Rural District Council, bombardier, Reserve (Active Service) Battery, Royal Field Artillery.

PERSONAL.

Mr. M. H. Sykes, borough engineer of Stockton-on-Tees, died, we regret to state, last week.

Mr. E. R. Ennals, surveyor to the Hartismere Rural District Council, has received an increase of salary.

Mr. W. H. Eley, surveyor to the Newmarket Urban District Council, has been voted an increase of salary.

Mr. S. Sladden, surveyor to the Bridge (Kent) Rural District Council, is recovering from an attack of congestion of the lungs.

Mr. P. B. Grinham, highways surveyor to the Alresford Rural District Council, has had his salary raised from £160 to £180 a year.

Mr. Robert Forbes, water engineer and assistant burgh surveyor of Buckie, has been appointed sanitary inspector to the Cumnock Town Council.

Mr. H. Anderson, Mr. W. J. Isaacs, Mr. W. Walker and Mr. J. H. Rickman, members of the drawing-office staff of the York Corporation, have each received increases of salary.

Mr. W. H. Hall, ASSOC.M.INST.C.E., assistant in the borough engineer's office, Southwark, has been appointed temporary assistant engineer under the Port of London Authority.

Mr. E. B. B. Newton, borough engineer of Paddington, will, on Thursday evening, the 18th inst., address the members of the Municipal and County Club on "The Use, Abuse, and Misuse of Roads."

Corporal A. B. Lowrie, an assistant on the secretarial staff of the Roads Improvement Association, who enlisted in the Army Service Corps at the end of October, has now been recommended for promotion to staff-sergeant.

Mr. John K. Bowen has been appointed county surveyor to the Waterford County Council. Mr. Bowen is the son of Mr. Patrick Bowen, J.P., Monkstown, and has been engineering inspector for the Congested Districts Board at Claremorris.

Mr. J. F. Hawkins, county surveyor of Berkshire, had the honour of being received by His Majesty the King at Buckingham Palace on Tuesday last, to submit the design of the new Albert Bridge between Old Windsor and Datchet. The design submitted was that prepared by the county surveyors of Berks and Bucks, to be carried out on the system of the Trussed Concrete Steel Company, Limited. His Majesty expressed his approval of the design. Mr. Hawkins also submitted to His Majesty the design of the new bridge over the Thames between Goring and Streatley, of which he is engineer.

Mr. Thomas P. Collinge, borough engineer and surveyor of Mansfield, who was recently appointed borough engineer, surveyor and waterworks engineer of Rotherham, in succession to Mr. E. B. Martin, has been directly connected with municipal work for upwards of twenty years, having held responsible positions at Carlisle, Nelson, and other places. He was deputy city engineer and surveyor of Carlisle from 1904 to 1908. He is an associate-member of the Institution of Civil Engineers, and a member of the Institution of Municipal and County Engineers. His salary at Rotherham will commence at £500, rising by £50 per annum.

At the meeting of the Institution of Civil Engineers on Tuesday, February 23rd, the members received an intimation that His Majesty the King of the Belgians and Admiral Lord Fisher of Kilverstone, First Sea Lord of the Admiralty, had consented to accept election as honorary members of the institution. The election was effected forthwith by acclamation, and the addition of these illustrious names to the small group of distinguished men who form the institution's roll of honorary members is a source of much satisfaction to the members.

Proposed Arterial Roads.—Suggested arterial roads in Greater London were discussed at a recent meeting of the Middlesex County Council upon a motion of the Highways Committee viewing with favour the principle of two arterial roads—one from Denham, Bucks, through Middlesex to the Colchester road; the other from Chertsey, Surrey, joining the other arterial road at Redhill, Edgware road, and continuing there to join the St. Albans road and the Great North road at Hadley High Stone.

HILL'S MOTOR ACUUM ROAD CLEANSER.

DEMONSTRATION AT HUDDERSFIELD.

On Thursday of last week a demonstration of the working of Hill's patent motor vacuum road cleanser was given in Huddersfield for the benefit of the Huddersfield Corporation, the demonstration also being attended in force by a large number of representatives of neighbouring municipalities, including Birkenhead, Bradford, Dewsbury, Leeds, Oldham, Royton, Sheffield and Wakefield.

The machine was first introduced into this country from Italy, and demonstrations were given in various parts of the kingdom. The world's patent rights were then purchased by Hill's Patent Motor Vacuum Road Cleanser, Limited, and that company at once set out to alter the machine in conformity with the requirements and demands of British cleansing authorities. The Huddersfield demonstration was the first that has been given publicly with the machine in its present form, and it was immediately apparent that very great improvements had been effected.

Three machines were on exhibition, one being at the fire station for inspection purposes, while the other two were used for the demonstrations given morning and afternoon over routes specially selected by Mr. K. F. Campbell, M.INST.C.E., the borough engineer of Huddersfield, for their diversity of pavement and conditions, embracing, as they did, granite-sett, local stone paving, wood block paving, tar asphalt and macadam-roemac.

A specially prepared track of ashes had been prepared owing to the fact that a keen frost during the previous day and night had made this necessary in order that the capabilities of the cleanser might be displayed to the full. A bright sun coming out brought about a state of conditions that could not prevail in the ordinary way—that is to say, the machine was asked to sweep both wet and dry material at one and the same time; but the machines responded excellently, as was clearly evinced from the favourable criticisms heard on all hands.

The machine in its original form has been described in these columns on a previous occasion, but the improvements are so marked as to require further comment. The machine, as now constituted, consists of four main components—viz., (1) a complete 45-h.p. motor chassis, specially designed for constant running at slow speeds; (2) a cylindrical brush and shield; (3) a large receiver placed behind the sweeping cylinder for collecting the sweepings; (4) a water tank of 100 gallons capacity, together with pump and jets for spraying atomised water to the road surface in front of the brush, thus ensuring dustless and hygienic sweeping.

A very marked improvement is in the increased width of track swept, this being now 7 ft. as against 4 ft. 6 in. formerly, while the brush now extends beyond the rear wheels, and it is thus possible to sweep the channels equally with the rest of the roadway. The capacity of the receiver has also been increased to 75 cub. ft., and it will now hold approximately 3 tons of sweepings.

The water tank and jets are a great improvement, as they not only prevent all possibility of dust rising during the sweeping operations, but they also tend to settle all light dust in the receiver. The water is forced through the jets by a centrifugal pump, and is sprayed on to the road in atomised form, a great economy in water consumption being thereby effected. A soluble disinfectant is added to the water; thus, not only the refuse collected, but the road itself is disinfected, and this still further adds to the hygienic advantages claimed for the Hill machine.

FOR OTHER ADVERTISEMENTS
See End of Paper.

THE Acton Urban District Council requires a Temporary Clerk in the Surveyor's Office. Only persons with considerable experience need apply. Salary £3 3s. per week. Applications, with particulars of experience, and testimonials, to be forwarded at once to F. Sadler, Surveyor, Council Offices, Acton, W.
March 1, 1915. (2,442)

WANTED, an experienced Foreman for Road Work, including Tar-spraying with Llewellins & James' Machine. Apply, in writing, stating previous experience and wages required, to the Yorkshire Road Tar Binders, Limited, Standard Buildings, Leeds.
(2,441)

COUNTY BOROUGH OF WEST HARTLEPOOL.

The Corporation require a "Superintendent of Highways and General Foreman," and invite applications from persons under 45 years of age, who must have a thorough knowledge of modern road construction and maintenance, cleansing, watering, &c., and all other duties generally appertaining to such office, to which duties he will be required to devote his whole time.

He must also be experienced in the organisation and supervision of manual and team labour.

The salary will be £156 a year.

Applications, in candidate's own handwriting, made on forms to be obtained from the undersigned, stating age, experience, present and previous appointments, accompanied by copies of three recent testimonials, to be sent to me, endorsed "Suprintendent of Highways," on or before the 15th day of March, 1915.

Canvassing will disqualify any candidate.

NELSON F. DENNIS,
Borough Engineer.

Municipal Buildings, West Hartlepool.
March 3, 1915. (2,436)

COUNTY BOROUGH OF HUDDERSFIELD.

The Education Committee require the services of a competent Temporary Architectural Assistant. The engagement will be for about twelve months, subject to satisfactory service. Candidates must be capable of preparing, under supervision, detail drawings, measuring up, and taking off Quantities. Preference will be given to applicants with previous experience in school buildings. Salary £120 per annum. Applications, in candidate's own handwriting, stating age, and giving full particulars of experience, accompanied by three testimonials of recent date, to be sent to me not later than 10 a.m. on Monday, the 15th March, 1915. Canvassing strictly prohibited.

K. F. CAMPBELL, M.INST.C.E., M.I.E.E.,
Borough Engineer.

1 Peel-street, Huddersfield.
March 3, 1915. (2,437)

URBAN DISTRICT OF WOOD GREEN.

TENDERS FOR PRIVATE STREET WORKS.

The Council invite Tenders for works of Private Street Improvements in (*a*) Lansdowne-road (Section 11), (*b*) Passageway by Alexandra Park Tavern, both within the Urban District.

The Plans, Sections and General Conditions may be seen, and Bills of Quantities obtained, from the Engineer and Surveyor to the Council upon production of a receipt signed by me for a deposit of one guinea, which will be returned on receipt of a *bonâ-fide* Tender, provided the latter is not withdrawn.

Last day for delivering Tenders (which must be sealed and endorsed "Tender for Private Street Works"), Wednesday, 10th March, 1915, at 5 p.m.

The Contractor will be required to execute a formal Contract, and furnish security through an approved Guarantee Insurance Company for the due performance of the same, and also pay the rates of wages and observe the hours of labour specified in the Schedule annexed to the General Conditions.

The lowest or any Tender not necessarily accepted.

(By order)
WM. P. HARDING,
Clerk of the Council.

Town Hall, Wood Green.
March 1, 1915. (2,438)

THE Surveyor to a progressive urban district Council on the S.E. (Kentish) coast is prepared to take a Pupil in his Office, where thorough general experience and personal supervision could be obtained. Water Supply, Sea Outfall, Road Reconstruction, and Groyne Schemes in hand. Two clerical assistants kept. Moderate premium.—Box 1,510, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,439)

TWO fully qualified engineering assistants, who are about to terminate a 2½-years' engagement with large County Borough, will shortly be disengaged. Ages 27 and 28 years respectively; municipally trained, and hold testamurs Institution of Municipal and County Engineers. Large experience in all kinds of municipal engineering.—Box 1,511, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,440)

A NEW MECHANICAL FILTER.

For many years Messrs. Mather & Platt, Limited, have been engaged in the construction and installation of large-sized pressure filters for public or industrial purposes, and the firm is to possibly for some of the largest plants for the filtration and purification of

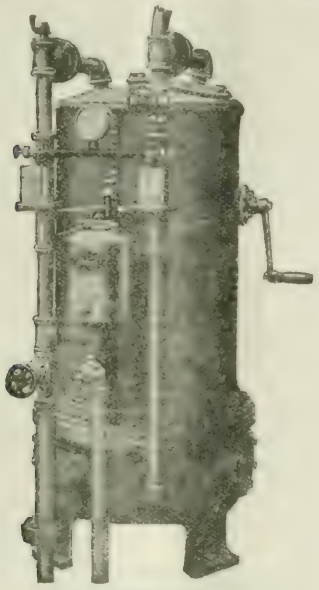

Fig. 1.

water at home and abroad. With the view of meeting the requirements of comparatively small users Messrs. Mather & Platt have now placed on the market a new type of filter specially designed to fulfil the conditions met with in the water supply of public institutions, country mansions, tea and rubber estates, &c., where a cheap and efficient plant for the purification of the water supply is just as much a necessity as in the case of municipalities and large works.

The new filter is illustrated in Fig. 1. Its construction will be readily understood by reference to Fig. 2. The water enters at the top, and, after percolating through the filtering medium, passes through the nozzles into the cast-iron base, and is delivered through the clean-water pipe and valve. A special feature is the design and arrangement of nozzles which are fitted into the base. These are made of phosphor-bronze with copper perforated domes, and give even distribution over the whole bed, both when filtering and during the washing operation. They are screwed in from the underside, access doors being provided so that any nozzle may be taken out, examined and replaced without disturbing the filtering medium.

For supplying the coagulating solution, a small copper tank is provided, which normally holds one day's supply; this tank is secured to the pipes as an integral part of the filter. It is fitted with special valves, a sight glass and regulating jets, by means of which the required quantity of chemical is admitted to the water. Several of these regulating jets are provided, each to give varying proportions of solution, and when it is desired to change them one jet can be substituted for another in a few seconds. To control the supply of solution according to the rate of flow, Messrs. Mather & Platt have introduced a special feature in the shape of an adaptation of the Venturi tube, which ensures that the supply of chemical shall always be in direct proportion to the water supply. It has no moving parts, the action being purely a hydraulic one, and absolutely positive.

The new filter is complete and self-contained. It can be readily transported and erected in any convenient position without special foundations or specially skilled labour. It can be mounted on a motor wagon or other vehicle, and, connected to a pump driven off the main engine, enables pure water to be instantly attainable at any time or place where there is a water supply. It is obvious that this would [illegible] engaged in out-of-the-way places, where the quality of the water is often very doubtful.

Messrs. Mather & Platt [illegible] relating to their new small filter. Copies can be obtained on application to Park Works, Manchester.

SEWAGE DISPOSAL AT FROME.

In his annual report for the year ended March 31st last—some extracts from which were given in our issue of January 29th last—Mr. F. W. Jones, Assoc.M. Inst.C.E., surveyor to the urban district council, makes a reference to the sewage purification works at Frome,

	Total cost.	Cost of treating 1,000,000 gallons.	Rate levied to meet expenditure.	Cost per head of population.
	£ s. d.	£ s. d.	d.	s. d.
Administrative charges	121 1 7	1 8 2	1·31	1 1¼
Capital charges ..	1,428 19 4	6 [illegible]	10·89	2 11½
Totals	2,250 3 11½	8 11 5	15·63	4 1

which, completed at a cost of £20,075, were put into operation in May, 1912.

The cost of dealing with 1,000,000 gallons of sewage, based upon the quantity arriving at the works, and upon the basis of population taken on the last census,

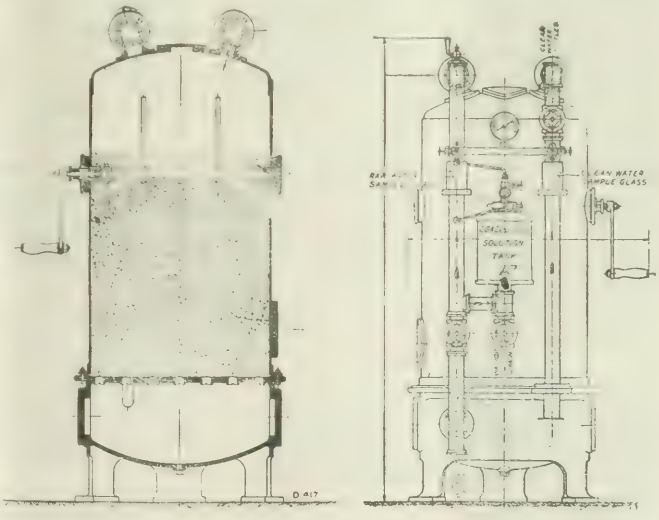

Fig. 2.

is given in the above table both for the administrative and capital charges.

Very satisfactory effluents have been obtained since the inauguration of the works. Apart from a few tons of coke breeze—which is obtained at the price of 2s. per ton—all steam required for sewage pumping has been obtained from the destruction of town refuse.

MIXING OF CONCRETE.

EFFECT OF VARYING AMOUNT OF WATER.

In a paper read before the Connecticut Society of Engineers recently, results are given of a series of careful tests made to determine the effect of varying the percentage of water in concrete. Summarised, the conclusions drawn are as follow:—

The percentage of water has a direct bearing upon the strength of concrete. Nevertheless, it is the exception rather than the rule that the engineer concerns himself with the question of mixing beyond seeing that the proper proportions of sand, stone and cement are used. Careful tests are made of the cement and steel, both standard articles put out by firms which have reputations to maintain; on rare occasions the water is analysed, but no attempt is made to control the mixing. On some pieces of work the contractor is furnished the cement, so that there will be no temptation to skimp on materials. He is then given the liberty to mix these materials as he sees fit. He may aim to get the maximum strength out of them, but it is probable that he will strive rather to keep the cost of mixing and placing at a minimum.

Of course, it must be admitted that the strongest mixture is not always the most desirable or economical. In preparing the specimens for these tests it was found necessary, when making mixtures containing more than 27·5 per cent of water, to increase the proportions 10 per cent in order to fill the moulds. This indicates an increase in density which was obtained at a loss of strength. However, in some cases this is highly desirable. Often bulk and impermeability are the two requisite features. In reinforced-concrete structures a moderately wet mixture is far more practical than a dry one; but it must not be forgotten that the use of wet mixtures increases the cost of materials. An increase in density means a corresponding increase in raw materials. The additional water weakens the concrete, and therefore a richer mixture or lower unit stresses must be used. The former is preferable, for the beams and columns in concrete building are always heavier than the corresponding members of steel or wooden structures.

If a wet mixture is used, the engineer should be cautious in permitting the removal of the forms at an early date. In some of the tests the wet mixtures were very slow to develop their strength. The use of such consistencies in practice would necessitate extreme care. It might be a month or more before the forms could be struck with any feeling of security.

The question of consistency is not altogether a laboratory question. The increased cost of materials due to the use of wet mixtures may be more than balanced by the saving in placing; but the engineer should bear in mind that consistency has a direct relation to strength, and if he permits a wet mixture he should provide for the same in his design. In any event he should control the details of the mixing.

Architects' War Committee.—The Professional Employment Committee have under consideration certain schemes of work with a view to affording small temporary employment to architects who are without work in consequence of the war. Applications can only be considered from British architects dependent on their profession for a living, whose present difficulties are directly due to the war, and who are not eligible for military service. Applications should, in the first instance, be made to the hon. secretary of the Professional Employment Committee of the Architects' War Committee, 28 Bedford-square, W.C.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

DISTRICT SURVEYOR.—March 8th.—For the district of Rotherhithe.—Clerk, London County Council, County Hall, Spring-gardens, London, S.W.

GAS ENGINEER AND MANAGER.—March 8th.—Corporation of Mossley. £250—£300 a year.—The Town Clerk.

FOREMAN.—March 8th.—Pontypridd Urban District Council. £110—£130 per annum.—Mr. J. C. Jones, clerk.

ROAD FOREMAN.—March 8th.—Durham County Council. 50s. per week.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

SURVEYOR.—March 11th.—Louth Rural District Council. £100 per annum.—Mr. F. C. Chard, clerk.

CLERK OF WORKS.—March 12th.—Mayo County Council. £2 10s. per week.—Chairman, County Council Offices, Castlebar.

TEMPORARY TOWN PLANNING ASSISTANT.—March 15th.—Hazel Grove and Bramhall Urban District Council. £2 5s. per week.—Mr. G. Severn Doncaster, surveyor, Public Offices, Hazel Grove.

WORKS SUPERINTENDENT.—March 15th.—West Ham Town Council. £250 per annum.—Mr. J. S. D. Moffat, tramways manager, Tramway Offices, Greengate-street, Plaistow, E.

MECHANICAL ENGINEER.—March 16th.—North Bromsgrove Urban District Council.—Mr. Francis T. Levens, clerk, 110 High-street, Bromsgrove.

COUNTY SURVEYOR.—March 20th.—Notts County Council. £500 per annum.—Mr. H. Hampton Copnall, clerk, Shire Hall, Nottingham.

CLERK OF WORKS.—March 20th.—Blaenavon Urban District Council. £130 per annum.—Mr. I. G. G. Thomas, clerk.

SANITARY INSPECTOR.—March 25th.—Sutherland County Council. £120 per annum.—Mr. A. Argo, county clerk, Golspie, Sutherlandshire.

SURVEYOR OF HIGHWAYS.—March 25th.—Abingdon Rural District Council. £2 10s., to a maximum of £150.—Messrs. B. & E. M. Challoner, clerk, 67 Stert-street, Abingdon.

ASSISTANT ENGINEERS.—Public Works Department of the Government of the Gold Coast. £350—£400 a year.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

CLERKS.—Corporation of Chelmsford. £2 2s. and £1 10s. per week.—Mr. Percival T. Harrison, borough engineer and surveyor.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BRADFORD.—March 31st.—Designs for the replanning of streets, for the corporation.—The Town Clerk.

GALEMIRE.—Designs for a small hospital, for the Galemire (Whitehaven) Joint Hospital Committee.—Mr. E. B. Croasdell, clerk, Union Hall, Whitehaven.

STEPNEY.—Designs for municipal buildings, for the borough council. Mr. H. T. Hare, F.R.I.B.A., has been appointed assessor.—Mr. G. W. Clarke, town clerk, 15 Great Alie-street, Whitechapel.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

CHELMSFORD.—March 8th.—For the erection of two or four cottages, for the rural district council.—Mr. J. Dewhurst, engineer and surveyor.

NORTH DUBLIN.—March 9th.—For the erection of sixty-nine cottages, for the rural district council.—Mr. J. O'Neill, clerk.

DEPTFORD.—March 9th.—For the erection of baths and wash-houses and a branch library, for the borough council.—Mr. A. Purkis, town clerk, Town Hall, New Cross.

WATFORD.—March 9th.—For the erection of two pairs of semi-detached cottages, for the rural district council.—Council Offices, 9 Market-street, Watford.

BRIDGWATER.—March 9th.—For the erection of a temporary hospital, for the corporation.—Borough Surveyor.

NORTHWICH.—March 10th.—For sinking a borehole, for the urban district council.—Messrs. J. Newton, Son & Bayley, 19 Cooper-street, Manchester.

LLANDUDNO.—March 10th.—For the erection of an

office, for the urban district council.—Mr. W. T. Ward, deputy engineer and surveyor, Town Hall.

BINGLEY.—March 10th.—For additions to offices, for the urban district council.—Mr. H. Bottomley, engineer and surveyor.

PORTLAND.—March 10th.—For the erection of new council offices, for the urban district council.—Messrs. Petter & Warren, architects, Yeovil.

ALFORD.—March 11th.—For the erection of a school, for the Alford School Board.—Messrs. D. & J. R. McMillan, architects, 105 Crown-street, Aberdeen.

GLOUCESTER.—March 11th.—For the erection of a pumping station and other works, for the corporation.—Messrs. Fox, Moore, Baterman & Fox, 5 Victoria-street, Westminster, S.W.

ASSISTANT ELECTRICAL ENGINEER.—March 11th.—Redditch Urban District Council. £170 a year.—Mr. G. W. Robson, clerk.

NOTTINGHAM.—March 11th.—For the erection of twenty-seven cottages and two blocks of tenements, for the corporation.—Mr. A. Brown, city engineer, Guildhall.

MACCLESFIELD.—March 13th.—For the erection of a chimney shaft, for the Baths Committee.—Mr. S. C. Baggott, borough surveyor.

SOMERSET.—March 13th.—For the erection of a school, for the Education Committee.—Messrs. Samson & Colthurst, architects, 1 Hammet-street, Taunton.

BRADFORD.—March 13th.—For the erection of a destructor, for the corporation.—City Architect.

LLANDILOFAWR.—March 15th.—For the construction of Rhydymaerdy Bridge across the river Amman, for the rural district council and the Ammanford Urban District Council.—Mr. Evan Jones, surveyor, Glancennen, Llandebie, and Mr. David Thomas, surveyor, Quay-street, Ammanford.

BOLTON-UPON-DEARNE.—March 15th.—For the erection of 288 dwelling-houses, for the urban district council.—Messrs. Garside & Pennington, architects, Ropergate, Pontefract.

BOLTON-UPON-DEARNE.—March 15th.—For the erection of 293 houses and eight houses and shops, for the urban district council.—Messrs. Garside & Pennington, architects, Ropergate, Pontefract.

TREDEGAR.—March 15th.—For the erection of a caretaker's lodge at the cemetery, for the urban district council.—Mr. W. Lloyd Roach, surveyor.

HAMPSHIRE.—March 17th.—For the erection of a school, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

WALLASEY.—March 18th.—For the erection of workshop and men's room, and the construction of foundation for gas engine, for the corporation.—Mr. J. H. Crowther, engineer and manager of the gasworks, Limekiln-lane, Wallasey.

READING.—March 18th.—For the erection of a public convenience, for the corporation.—Mr. J. Bowen, borough engineer and surveyor.

HEMSWORTH.—March 20th.—For laying water mains, for the rural district council.—Mr. T. H. Richardson, engineer, Hemsworth.

STEVENAGE.—March 22nd.—For the erection of eight cottages, for the urban district council.—The Surveyor.

CHELMSFORD.—March 22nd.—For the erection of an engine-house and incidental works, for the corporation.—Mr. P. T. Harrison, borough engineer.

SOUTHALL-NORWOOD.—March 23rd.—For the erection of fifty-four houses, for the urban district council.—Mr. R. Brown, engineer and surveyor, Southall.

NORTHAMPTON.—March 25th.—For the erection of twenty cottages, for the corporation.—Waterworks Office, Fish-street, Northampton.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

ANGLESEY.—April 7th.—For the erection of new schools, for the Education Committee.—Mr. J. Owen, county architect, Menai Bridge.

DRAUGHTSMEN.—Sierra Leone Government, Public Works Department. £300—£350.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

DRAUGHTSMAN.—Nigerian Government Railway. £300—£350 per annum. Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

Iron and Steel.

BURY (Lancs).—March 8th.—For structural steel and steel window frames at the generating station, for the corporation.—Mr. J. A. Settle, borough engineer, Bank-street.

PLYMOUTH.—March 9th.—For the supply of cast-iron pipes, for the corporation.—Mr. F. Howarth, city engineer.

EDINBURGH.—March 10th.—For the supply of 1,100 tons of cast-iron pipes for the Water Trustees.—Messrs. J. & A. Leslie & Reid, engineers, 12 St. Giles-street, Edinburgh.

CUDWORTH.—March 10th.—For the supply of cast-iron gas main, for the urban district council.—Mr. W. T. Lynam, manager, gasworks, Cudworth.

CLEETHORPES.—March 11th.—For the supply and erection of a steel beacon, for the urban district council.—Messrs. Chatterton & Alford, 9 Victoria-street, Westminster, London, S.W.

COVENTRY.—March 15th.—For the supply of cast-iron pipes, lead pipes, solder, and hydrant and valve boxes, for the corporation.—The Water Engineer, St. Mary's Hall, Coventry.

CHELMSFORD.—March 17th.—For the supply of pumping machinery, and for the provision and erection of a pumping installation, complete with all incidental works, for the corporation.—Mr. Percival T. Harrison, borough engineer.

WALLASEY.—March 18th.—For the supply and erection of a G.B. elevator and coke-screening plant at the gasworks, for the corporation.—Mr. J. H. Crowther, engineer and manager, Limekiln-lane, Wallasey.

HEMSWORTH.—March 20th.—For supplying and laying cast-iron mains, for the rural district council.—Mr. T. H. Richardson, engineer, Hemsworth.

BELPER.—March 25th.—For providing and laying cast-iron pumping main, for the urban district council.—Messrs. G. & F. W. Hodson, Bank Chambers, Loughborough.

CARMARTHEN.—March 26th.—For providing and laying water mains, for the rural district council.—Mr. W. E. Jones, surveyor, Rock Hill, Llanarthney.

BLACKBURN.—For the supply of iron, steel, bolts, and screws, for the corporation.—Mr. J. H. Cowell, Tramways Manager.

Roads.

SOUTHWELL.—March 8th.—For the supply of road material, for the rural district council.—Mr. A. Edwards, highway surveyor, Edwinstowe, Newark.

FLEETWOOD.—March 8th.—For the supply of road materials, for the urban district council.—Mr. A. Cottam, clerk.

DURHAM.—March 8th.—For the supply of road materials, for the county council.—Mr. A. E. Brookes, county surveyor, Shire Hall, Durham.

LEAMINGTON.—March 8th.—For the supply of 3,000 tons of road stone, for the corporation.—Road Surveyor, Adelaide-road.

WING.—March 8th.—For the supply of 800 tons of granite, and 1,200 tons of slag, sand and gravel, for the rural district council.—Mr. M. G. Gurney, surveyor.

CHORLEY.—March 8th.—For the supply of road materials, for the rural district council.—Mr. P. Whalley, highway surveyor, High-street, Chorley.

BUCKLOW.—March 8th.—For the supply of granite setts and macadam, gritt setts and slag, for the rural district council.—Mr. R. Curtis Cordon, surveyor, Knutsford, Cheshire.

DURHAM.—March 8th.—For the hire of steam rollers and steam tractor hauling plants, for the county council.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

FAVERSHAM.—March 9th.—For the supply of broken pit flints, shingle, and fine gravel, for the rural district council.—Mr. J. G. Chittenden, district surveyor, Ashford-road, Faversham.

UPPINGHAM.—March 9th.—For the supply of granite and screenings, for the rural district council.—Mr. F. Oakley, clerk.

RYE.—March 9th.—For the supply of materials, for the rural district council.—Mr. L. Amon, Watch Bell Chambers, Rye, Sussex.

SCULCOATES.—March 9th.—For the supply of stone, gravel, asphalt, tar, and coal for steam roller, for the rural district council.—Mr. A. Culkin, surveyor, 113 Alliance-avenue, Hull.

CHESTERTON.—March 9th.—For the supply of 5,000 tons of broken granite, for the rural district council.—Mr. J. Dunn, surveyor.

HOYLAKE.—March 9th.—For the supply of kerbs, channels, setts, cement concrete flags and macadam, chippings, for the urban district council.—Engineer and Surveyor.

BOLLINGTON.—March 9th.—For paving work and the supply of 1,000 tons of granite setts, for the urban district council.—Mr. H. W. A. Carter, surveyor.

FOLESHILL. — March 9th. — For the supply of granite, for the rural district council.—The Surveyor.

WHITEHAVEN.—March 10th.—For works of road improvement, for the rural district council.—Mr. G. Boyd, Union Hall, Whitehaven.

LEWISHAM.—March 10th.—For the supply of broken granite, for the borough council.—Borough Surveyor, Town Hall, Catford, S.E.

RAINFORD.—March 10th.—For the supply of macadam, chippings and dust, tarred macadam, and tarred chippings, for the urban district council.—Mr. B. Smith, clerk.

BIRMINGHAM.—March 10th.—For the construction of Elmhurst-road, Grove Hill-road, Headingley-road, and Uplands-road (part of), Handsworth, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

HARTISMERE.—March 10th.—For the supply of 2,700 tons of 1¾-in. granite and 1,395 tons of pit stones, for the rural district council.—Mr. Harold Warnes, clerk, Eye, Suffolk.

HAYES.—March 10th.—For the supply of 8,000 gallons of refined coal tar complying with the Road Board specification, for the urban district council.—Mr. D. C. Fidler, surveyor, Council Offices, Hayes End, Middlesex.

ENFIELD.—March 10th.—For making up Queen's-road and Stanley-road, for the urban district council.—Mr. Richard Collins, surveyor.

LOFTUS.—March 10th.—For the supply of highway materials, for the urban district council.—Mr. B. J. Wormleighton, surveyor.

ROCHDALE.—March 10th.—For making good certain passages, for the corporation.—Borough Surveyor.

RAWTENSTALL.—March 11th.—For making up certain streets, for the corporation.—Mr. J. Johnson, borough surveyor.

SUTTON (Surrey).—March 11th.—For the tar-spraying of various roads in the district, for the urban district council.—Mr. Hedley Grieves, surveyor.

LEEDS.—March 11th.—For making up certain streets, for the corporation.—Highways and Permanent Way Department, 155 Kirkstall-road, Leeds.

CAISTOR.—March 12th.—For the supply of 7,100 tons of granite, 4,760 tons of slag, and 800 tons of tar-macadam, for the rural district council.—Mr. A. A. Padley, clerk.

MAYO.—March 12th.—For steam rolling about 12 miles of roads, for the county council.—Mr. E. K. Dixon, county surveyor, Castlebar.

CORK.—March 12th.—For the supply of stones for macadamised roads, for the corporation.—City Engineer.

DURHAM.—March 12th.—For the supply of whinstone, slag, tar-macadam, pitch, tar, creosote oil, and cartage, for the rural district council.—Mr. G. Gregson, surveyor.

EASTRY.—March 12th.—For the supply of flints and steam rolling, for the rural district council.—Mr. D. E. Foster, surveyor, Dover-road, Sandwich.

STAINES.—March 12th.—For the supply of broken macadam and chippings, Kentish ragstone, and Derbyshire or Somerset limestone, for the rural district council.—Mr. G. W. Manning, surveyor.

KING'S LYNN.—March 13th.—For the supply of road materials for the year, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

PONTARDAWE.—March 13th.—For the supply of road metal and haulage, for the rural district council.—Mr. J. Morgan, engineer.

GAINSBOROUGH.—March 13th.—For the supply of road materials, for the urban district council.—Mr. S. W. Parker, engineer and surveyor.

AYLESBURY.—March 13th.—For the supply of 2,706 tons of granite and 610 tons of slag, for the rural district council.—Mr. J. Cook, surveyor.

GREAT OUSEBURN.—March 13th.—For the supply of whinstones, limestones, annealed slag, and furnace slag, for the rural district council.—Mr. H. S. Thompson, clerk, Boroughbridge.

HASTINGS.—March 15th.—For the supply of 40,000 gallons of refined or distilled tar, for the corporation.—Mr. P. H. Palmer, borough engineer.

WREXHAM.—March 15th.—For the supply of road stone, for the rural district council.—The Surveyor.

BILSTON.—March 15th.—For the supply and delivery of broken stone, for the urban district council.—Mr. Vincent Turner, engineer and surveyor.

WEST SUFFOLK.—March 15th.—For the supply of local stone, gravel, tools, surface tarring, and the hire of steam rollers, for the county council.—Mr. W. Lionel Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

SUTTON COLDFIELD.—March 15th.—For the supply of road materials, for the corporation.—Mr. W. A. H. Clarry, borough engineer and surveyor.

POCKLINGTON.—March 15th.—For the supply of best blue stone and rag, for the rural district council.—Mr. T. Robson, clerk.

MAIDSTONE.—March 15th.—For the supply of ragstone spalls, setts, kerbs, flints, tarred ragstone, tarred ragstone macadam, gravel and sand, for the corporation.—Mr. T. F. Bunting, borough surveyor.

HAVERHILL.—March 15th.—For the supply of broken granite, slag, and slag tar-macadam, for the urban district council.—Mr. John H. Clarke, surveyor.

HAZEL GROVE.—March 16th.—For the supply of broken stone, setts, kerbs and chippings, for the urban district council.—Mr. G. Severn Doncaster, surveyor.

KIDDERMINSTER.—March 16th.—For the supply of broken granite, granite screenings, broken slag, and slag screenings, for the rural district council.—Mr. G. J. Shepherd, surveyor, 85 Chester-road, Kidderminster.

TUTBURY.—March 17th.—For the supply of broken granite and limestone, for the rural district council.—Mr. F. Rist, surveyor, Tatenhill, Burton-on-Trent.

ELY.—March 17th.—For the supply of 3,150 tons of granite, and 1,050 tons of gravel, for the rural district council.—Mr. F. W. Firby, district surveyor, Sutton, Isle of Ely.

EASTBOURNE.—March 17th.—For the supply of Kentish ragstone, Portslade flints, compo. sand, tar, hand-picked flints, and cartage, for the rural district council.—Mr. C. M. Carter, district surveyor, Mount Sorrel, Hampden Park, Eastbourne.

NELSON.—March 17th.—For the supply of granite macadam, limestone macadam, paving chippings, pitch, cement, flags, kerb, grit setts, and creosote oil, for the corporation.—Mr. W. Shackleton, borough engineer and surveyor.

DONCASTER.—March 18th.—For the supply of dross, granite, carting, and manual labour, for the rural district council.—Mr. W. R. Crabtree, highway surveyor.

CHAILEY.—March 18th.—For the supply of flints, quartzite, Kentish rag, Mendip stone, and gravel, for the rural district council.—Mr. H. Kemp Walls, district surveyor, North Common, Chailey.

OSWESTRY.—March 20th.—For the supply of broken granite and broken and unbroken limestone, for the rural district council.—Mr. C. H. Bull, clerk.

SOUTHBOROUGH.—March 20th.—For the supply of 800 tons of basalt, granite, or other suitable stone, for the urban district council.—The Surveyor.

KIVETON PARK.—March 20th.—For the supply of broken slag, granite and tar-macadam, for the rural district council.—Mr. F. Hewitt, surveyor.

CASTLEFORD.—March 22nd.—For works of street improvement, for the urban district council.—Mr. W. Green, surveyor.

COVENTRY.—March 22nd.—For the supply of broken road stone, granite kerbs, granite setts, stoneware pipes, castings, and workmen's tools, for the corporation.—City Engineer.

PERSHORE.—March 23rd.—For the supply of stone and stone hauling in the district, for the rural district council.—Mr. A. E. Baker, clerk.

EAST STOW.—March 24th.—For making up Victoria-road, Stowmarket, for the rural district council.—Mr. H. E. Wilkes, clerk, Market-place, Stowmarket.

STROOD.—March 24th.—For the supply of road materials, for the rural district council.—Mr. L. Randerson, surveyor, Meopham, near Gravesend.

GATESHEAD.—March 27th.—For the supply of road materials, for the corporation.—Mr. N. P. Pattinson, borough engineer.

DROXFORD.—March 29th.—For the supply of 1,250 tons of granite or hard stone, for the rural district council.—Mr. J. King, surveyor, Droxford, Hants.

GATESHEAD.—March 30th.—For cement path work in position, for the corporation.—Mr. N. P. Pattinson, borough engineer.

Sanitary.

STOKE-ON-TRENT.—March 8th.—For the supply of press cloths, lime, chemicals, coal and slack, petroleum, and lubricating oils, for the sewage department.—Sewage Engineer, Leek-road, Stoke-on-Trent.

BOOTLE.—March 8th.—For sanitary improvements, for the corporation.—Borough Engineer.

BURRY PORT.—March 8th.—For the construction of a system of sewerage for the district of Burry Port, comprising cast-iron and stoneware pipe sewers, manholes, lampholes, flushing tanks, ventilating shafts, and other incidental works, for the urban district council.—Mr. A. P. I. Cotterell, 17 Old Queen-street, Westminster, and 28 Baldwin-street, Bristol.

STOCKTON-ON-TEES.—March 9th.—For the construction of a pipe sewer and manholes, and the under-drainage of land for sewage disposal purposes, for the rural district council.—Mr. J. Rodham, surveyor, Finkle-street.

MELTON MOWBRAY.—March 10th.—For the construction of a 9-in. sewer and the erection of ventilating shafts, for the rural district council.—Mr. G. E. Fryer, surveyor.

HAWARDEN.—March 12th.—For scavenging several sub-districts, for the rural district council.—Sanitary Inspector.

WIRRAL.—March 12th.—For the construction of sewage disposal works, for the rural district council.—Mr. W. W. Shennan, engineer and surveyor, 9 Hamilton-square, Birkenhead.

TIPTON.—March 15th.—For the construction of a sewer, for the urban district council.—Mr. W. H. Jukes, engineer and surveyor.

ROCHFORD.—March 15th.—For the removal of house refuse, for the rural district council.—Mr. F. Greg-on, Southend.

GLASGOW.—March 15th.—For the construction of sewers, for the corporation.—Office of Public Works, 64 Cochrane-street.

KEIGHLEY.—March 15th.—For emptying privies and ashpits, for the rural district council.—Mr. T. Burton, inspector.

PONTYPRIDD.—March 15th.—For the supply of disinfectants, for the urban district council.—Medical Officer of Health.

ALCESTER.—March 16th.—For scavenging certain districts, for the rural district council.—Mr. C. B. Machin, sanitary inspector.

THURROCK.—March 16th.—For the construction of about 4 miles 1 furlong 10 yards of sewers 9-in., 12-in. and 15-in. diameter, together with manholes and other appurtenances, for the Thurrock, Grays and Tilbury Joint Sewerage Board.—Mr. G. Midgley Taylor, engineer, Caxton House, Westminster, S.W.

WANDSWORTH.—March 17th.—For surface-water drainage works at Wandsworth Common, for the borough council.—Borough Engineer, 215 Balham High-road, S.W.

ECCLES.—March 20th.—For the construction of about 500 lin. yds. of egg-shaped sewer, 72 lin. yds. of egg-shaped sewer, 70 lin. yds. of stoneware pipe sewer, eleven manholes, and additions and alterations to existing manholes, for the corporation.—Mr. Thomas S. Picton, borough engineer.

INCE.—March 22nd.—For the construction of sewage disposal works, for the urban district council.—Mr. A. T. Swain, engineer and surveyor.

FINCHLEY.—March 24th.—For the construction of four chamber sewage filters, for the urban district council.—Mr. C. J. Jenkin, engineer, Council Offices.

Stores.

CHORLEY.—March 8th.—For the supply of broken granite and slag, rubble, chippings, grit setts, concrete flags, grit kerbs, earthenware pipes, pitch and oil, tools and implements, for the rural district council.—Mr. Percival Whalley, highway surveyor, Council Office.

BARNES.—March 8th.—For the supply of broken Guernsey or Alderney granite, broken pit flints and Thames ballast, disinfectants, ironmongery, Portland cement, forage and litter, granite kerb and channel, oils, paints, stoneware pipes, and horses and carts on hire, for the urban district council.—Engineer and Surveyor.

EPSOM.—March 9th.—For the supply of sewerage ironwork, gully gratings, shovels, picks, brooms, forks, dust skeps, disinfectants, Portland cement, stoneware pipes and gullies, kerbing and channelling, setts, broken granite, chippings and limestone dust, tar-paving and tar-macadam, coal and coke, hay, corn, bran, straw, bricks, paraffin, artificial stone paving, Thames ballast, Thames sand, veterinary surgeon's services, tar, pitch, and team labour, for the urban district council.—Mr. Edward R. Capon, surveyor, Bromley Hurst, Church-street, Epsom.

EXETER.—March 10th.—For the supply of bricks, bass brooms and refilling stocks of sweeping machines, Portland cement, building lime and slates, cast-iron pipes, granite channelling and kerb, York stone flags, concrete flags, stoneware pipes, miscellaneous iron castings, stone, sand, timber, ironmongery, and oils, for the corporation.—City Surveyor, Municipal Offices, Exeter.

GOOLE.—March 10th.—For the supply of broken granite, slag, tarred slag macadam, concrete flags, York stone flags, kerb, channel, stoneware pipes, Portland cement, gravel, sand, and coal, for the urban district council.—Mr. J. H. Castle, engineer and surveyor.

TWICKENHAM.—March 11th.—For the supply of ballast, shingle, flints, gravel, sand, granite cubes, setts, Portland cement, coal, coke, fodder, forage, oils, colours, iron castings, street gullies, and drain pipes, for the urban district council.—Mr. Fred. W. Pearce, surveyor.

NEWCASTLE-UPON-TYNE.—March 11th.—For the supply of bricks, cement, clot lime, flags (artificial, freestone and Caithness), hose pipes, iron, steel, horse-shoe nails, pitch, tar, creosote oil, paints, oils, privy pans, ashbins, road stones, sanitary pipes, scavenging brooms, shovels, timber, and waterproof coats and boots, for the corporation.—City Engineer.

WOLSTANTON.—March 12th.—For the supply of granite, cold-blast slag, granite chippings, tarred cold-blast slag, tarred granite, tar for tar-spraying, setts, paving bricks, kerbs, best glazed socket pipes, tar-spraying, anthracite, and alumino-ferric, for the urban district council.—Mr. W. F. Slater, surveyor.

EAST HAM.—March 12th.—For the supply of glazed stoneware pipes, glazed stoneware gully fittings, Portland cement, grey stone, chalk and blue lias lime, lime for sewage precipitation, stock and other bricks, Thames ballast, sand, coal, coke, engineers' sundries, broken granite, crushed granite, granite setts, Guernsey and other granite chippings, granite kerb and channelling, broken flints, cast-iron work, gullies, shovels, brooms, disinfectants, oilskins, hire of horses and carts, sewer ventilating columns, paving flags, sewer smocks, and redressing of setts, for the corporation.—Mr. C. Eustace Wilson, town clerk.

GAINSBOROUGH.—March 13th.—For the supply of broken granite or whinstone macadam, granite or whinstone setts, broken and block slag, slag chippings and dust, York setts, kerbs, channels, flags, concrete flags, stoneware and earthenware pipes, gullies, cast-iron pipes, tar-macadam, pitch and creosote oil, Portland cement and coal, for the urban district council.—Mr. S. W. Parker, engineer and surveyor.

SUTTON COLDFIELD.—March 15th.—For the supply of granite macadam and kerb, limestone macadam and setts, gravel and broken pebble stones, Yorkshire or pennant kerb, Rowley setts, earthenware pipes, cement and lime, iron castings, iron and steel, timber, hardware, oils and paints, and bass brooms, for the corporation.—Mr. W. A. H. Clarry, borough engineer and surveyor, The Council House, Sutton Coldfield.

COLNE.—March 15th.—For the supply of Lancashire and local setts, Portland cement, granite macadam, limestone macadam, lime, ironwork, team labour, kerbs and channels, pitch, creosote oil, earthenware pipes and gullies, and brushes, for the corporation.—Mr. T. H. Hartley, borough surveyor.

HEYWOOD.—March 20th.—For the supply of earthenware pipes, bends, junctions, taper pipes, traps, gullies, setts, kerbs, flags, pitch, creosote oil,

limestone chippings, granite macadam, granite chippings, Portland cement, cast iron, scavenger brooms and refilling machine brush, and paraffin oil, for the corporation.—Mr. J. B. Nuttall, borough surveyor.

LEEK.—March 22nd.—For the supply of flags, kerbs, channels, setts, macadam stone, chippings, limestone and slag tar-macadam, Portland cement, sanitary pipes, pitch, oil, scavengers' bass brooms, cast-iron manhole and lamphole covers, galvanised malleable manhole step irons, cast-iron gullies and frames, for the urban district council.—Mr. W. E. Beacham, engineer and surveyor.

EASTBOURNE. March 22nd. For the supply of Portland cement, cast-iron goods, wrought-iron goods, tools, miscellaneous ironmongery, oils, colours, glazed stoneware pipes, brooms and brushes, for the corporation. Mr. A. Ernest Prescott, borough surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

EASINGWOLD. Accepted for the supply of whinstone and slag, for the rural district council.—Mr. G. Thompson, surveyor:—

Whinstone. R. Summerson & Co., Cockfield; Ord & Maddison, Darlington; Monkhouse & Peart, Cowshill, Durham; G. Hodsman, York; Shackleton & Son, Goole.
Slag. W. H. Musgrave, Middlesbrough; G. Hodsman, York; W. C. Clark, Darlington; E. C. Tomkins, Middlesbrough; C. Mildred, Middlesbrough; J. N. Smith & Co., Leeds; Shackleton & Son, Goole; Mead & Co.
Tarred Slag. W. H. Musgrave, Middlesbrough; Mildred Partners, Middlesbrough; J. N. Smith & Co., Leeds; E. C. Tomkins, Middlesbrough; Slag and Tar Macadam Company, Darlington; Mead & Co.

CHISWICK. The following tenders are recommended for the acceptance of the urban district council by the General Purposes Committee:—

Lime, Cement, Plaster, &c.—Sankey & Co., Hammersmith; J. Knowles & Co., London.
Aluminoferric.—P. Spence & Sons, Limited, Manchester.
Copperas.—D. Matthews, Swansea.
Jute Press Cloths.—Woods, Sons & Co., London.
Oils (excepting Petrol).—Middleton Brothers, London; Robertson & Sons, Chiswick.
Tarred Limestone and Derbyshire Spar. J. Smart & Son, Westminster, S.W.
Tarred Slag and Siftings.—Prestwich & Sons, Dronfield.
Tarred Granite and Chippings.—Whitwick Granite Company, Limited, Whitwick.
Pipes and Gullies.—Sankey & Co., Hammersmith; J. Knowles & Co., Limited, St. Pancras, N.W.; Doulton & Co., Limited, London, S.E.
Tar.—Gas Light and Coke Company, London, E.C.; Clare & Co., Limited, Liverpool (Tarco).
Granite.—Brookes, Limited, Westminster, S.W. (Guernsey granite); Mountsorrel Granite Company, Limited, Loughborough (Mountsorrel granite).
Asphalt.—Limmer Asphalte Paving Company, Westminster, S.W.
Disinfectants.—Burt, Boulton & Haywood, Limited, London, E.C. (disinfectant powder); Forbes, Abbott & Lennard, Limited, London, E.C. (disinfecting fluid and creosote); Newton Chambers & Co., Limited, London, W.C. (Izal).
Kentish Flints and Hoggin.—Fry Brothers, Limited, Greenwich.
York Stone Paving.—H. Brooks, Yorkshire (subject to sample being satisfactory).
Artificial Stone Paving.—Brookes, Limited, Westminster, S.W. (Granolite); Atlas Stone Company, Limited, Cambridge (Atlas); Excelsior Patent Stone Company, Northamptonshire (Excelsior); Adamant Stone and Paving Company, Limited, Westminster, S.W. (Adamant); Threlkeld Granite Company, Limited, Cumberland (Threlkeld).

KNOTTINGLEY.—For extensions of main sewers, for the urban district council.—Mr. A. Hartley, consulting surveyor:—

J. Rodger & Son, Castleford	£747
E. A. Greaves, Castleford *	699

MARPLE.—Accepted for the supply of road materials and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor:—

Granite. — Pwllheli Granite Company; Penmaenmawr Granite Company.
Limestone.—J. Goddard, Marple.
Macclesfield Stone.—Ashton & Holmes, Macclesfield.
Derbyshire Setts.—Woodhead & Farrer, Mellor, Derbyshire.
Sanitary Pipes.—J. Duckett & Co.

MARSHLAND.—Accepted for the erection of houses, for the rural district council.—Mr. E. A. Walker, architect, Wisbech:—

Clenchwarton.—Wilkinson & Co., Wisbech (3 prs.), £1,230.
Emneth.—Wilkinson & Co., Wisbech (4 prs.), £1,520.
Lakesend.—Wilkinson & Co., Wisbech (2 prs.), £840.
Nordelph.—Elworthy & Co., Wisbech (3 prs.), £1,317.
Walpole St. Andrew.—G. J. West, Wisbech (3 prs.), £1,258.
Walpole St. Peter.—E. R. Langfer, Wisbech (3 prs.), £1,243.
West Walton.—A. T. Horsley, Wisbech (2 prs.), £799.
Three Holes.—J. Parker, Wisbech (4 prs.), £1,406.
Terrington, St. Clement.—No. 1 site: R. Eggleton, King's Lynn (2 prs.), £810. No. 2 site: H. W. Reeder, King's Lynn (2 prs.), £828.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MARCH.

9.—Institution of Civil Engineers: Sir Thomas Mason, Assoc.M.Inst.C.E., on "The Improvement of the River Clyde and Harbour of Glasgow, 1873-1914." Ballot for new members. 8 p.m.
11. Society of Architects: Mr. A. Montefiore Brice, Barrister-at-Law, on "The Law Relating to the Remuneration of the Architect." 7.30 p.m.
18.—Mr. E. B. B. Newton, Borough Engineer of Paddington, on "The Use, Abuse, and Misuse of Roads." Municipal and County Club. 8.30 p.m.

MAY.

28.—Royal Sanitary Institute: Meeting at Shrewsbury. Discussion on "The Value of Mechanical Filters in the Purification of Water." 7.30 p.m.

APPOINTMENTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SURVEYOR to rural district council in Kent has vacancy for Articled Pupil. Excellent opportunities.—Apply Box No. 1,508, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C. (2,429)

HAZEL GROVE AND BRAMHALL URBAN DISTRICT COUNCIL.

Applications are invited for the position of Temporary Town Planning Assistant in the Surveyor's Office (in lieu of one recently joined H.M. Army). Salary £2 5s. per week.

Applicants must be experienced levellers and surveyors, neat and quick draughtsmen, and thoroughly reliable in every way. One having had town planing or extensive field experience preferred.

Applications, in candidate's handwriting, giving age, qualifications, brief outline of experience, &c., accompanied by copies of two recent testimonials as to ability and personal character, must be addressed to and reach me on or before Monday, 15th March, 1915.

G. SEVERN DONCASTER,
Surveyor to the Council.

Public Offices,
Hazel Grove,
Near Stockport.
March 1, 1915. (2,428)

COUNTY COUNCIL OF NOTTS.
APPOINTMENT OF COUNTY SURVEYOR.

The County Council of Notts are desirous of receiving applications for the office of County Surveyor. A statement of the duties will be supplied on application to me.

The salary will be £500 per annum, and, in addition, travelling expenses will be paid.

Applications, marked "County Surveyor," with copies of not more than three recent testimonials, must be made upon Forms, which will be forwarded by me upon receipt of an addressed foolscap envelope.

The applications must reach me not later than midday on Saturday, the 20th day of March, 1915.

Canvassing is strictly prohibited, and will be deemed a disqualification.

(By order)
H. HAMPTON COPNALL,
Clerk of the County Council.

Shire Hall,
Nottingham.
March, 1915. (2,433)

ASSISTANT ENGINEERS required by the Government of the Gold Coast for the Public Works Department for two tours of twelve months, with possible extension. Age 25-40. Salary £350-£10—£400. Furnished quarters and first-class passages. Two months leave in England on full salary. After each tour increased to four months, if returning. Candidates should be Associate Members of the Institution of Civil Engineers, or have obtained one of the University Degrees or other distinctions in Engineering which are recognised as equivalent to that examination, and possess a practical knowledge of surveying, levelling and estimating, particularly in regard to municipal work, including building construction. Apply by letter at once to the Crown Agents for the Colonies, Whitehall-gardens, London, S.W. (2,422)

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. MARCH 12, 1915. No. 1,208.

Minutes of Proceedings.

Local Government Reform.

In the course of an address on Local Government Reform recently delivered to the members of the Municipal and County Club, Mr. Randolph Glen made some very interesting suggestions as to reforms in the law for doing away with certain anomalies in regard to drainage, highways, and appeals to Government departments. Dealing with drainage, Mr. Glen pointed out that the root of the trouble lay in the definition of drain and sewer, and expressed the opinion that the Legislature had put the cart before the horse in defining drain first and making everything else sewers. He suggested the following definitions: "Sewer" means (*a*) a pipe constructed by and at the expense of a local authority, or acquired by purchase, hire, or gift, or adopted with the consent, in writing, of the owner or majority of owners for the time being by a local authority, and used for conveying drainage of any kind from buildings or premises to a cesspool, or to another sewer, or to an outfall or disposal work; (*b*) a pipe constructed by a local authority or one or more private persons, or partly by a local authority and partly by one or more private persons, under a street in pursuance of a statute which, in relation to street works, enables the local authority to require the construction of such a pipe at the expense of one or more private persons; (*c*) a natural stream which receives drainage from one or more sewers, as hereinbefore defined, to an extent which, either alone or together with drainage from any other source, renders the stream substantially a mere conveyance of sewage, or a natural stream which has been adopted as a sewer by the local authority with the consent in writing of the owner or majority of owners for the time being of the stream. "Drain" means any pipe conveying such drainage as aforesaid, and not being a sewer as hereinbefore defined, or any drainage pipe which by agreement in writing entered into at the time of its construction and made between the owner or owners and the local authority is to be treated as a drain and not a sewer. Mr. Glen further proposed that any owner or the majority of owners of a drainage pipe should be empowered at any time to apply to the Local Government Board for authority on proof to the satisfaction of the board of its public utility.

In regard to highway law, Mr. Glen proposed, in the first place, to make actual enjoyment by the public for twenty years presumptive evidence of intention to dedicate. This presumption, however, should be rebuttable by showing that land has been in strict settlement, except that actual [illegible] evidence of dedication, in the absence of clear evidence of an intention not to dedicate. He [illegible] Private Street Works Act, 1892, of universal application, abolishing the distinction between "new" and "old" streets in London. The suggested modifications were: (*a*) That the cost of making up roads partly repairable by the inhabitants at large should be shared equally by owners and local authority; (*b*) that exempted properties (of railways, incumbents, &c.) should pay half what they would have to pay if not exempt, the other half to be paid by the local authority; (*c*) that an objection that a frontager is not the "owner" of property in respect of which he is charged should be allowed to be taken at any time. Mr. Glen also proposed to give owners power to apply to the Local Government Board for order making a non-repairable highway repairable by the local authority on proof to the satisfaction of the board of its public utility. Regarding appeals to Government departments, Mr. Glen's method of overcoming the growing dissatisfaction with the determination of such appeals was to allow appeals from all such departmental decisions to a new expert tribunal with similar constitution to that of the London Tribunal of Appeal. The proposed tribunal should consist of a lawyer as chairman, with one member a surveyor and another an accountant or architect, according to the nature of the case; and would sit where the case before it has arisen, if it considers this advisable, in order to save expense. While we do not agree with all that Mr. Glen proposes, his suggestions are certainly worthy of careful examination by those who have to grapple with the problems involved, and we hope to return to the matter in a future issue.

The "Single Private Drain" Problem.

We have never been able to understand on what principle the provisions of sec. 19 of the Public Health Acts Amendment Act, 1890, were restricted to the case of houses belonging to different owners. The framers of sec. 49 of the Kingston-upon-Hull Corporation Act, 1903, evidently failed to appreciate the restriction, that section being similar to sec. 19 of the public Act, with the important variation that it applies in every case where two or more houses are connected with a public sewer by a single private drain, whether the houses belong to different owners or to a single owner. So far so good; but the local Act still leaves room for controversy on the vexed question "What is a 'single private drain'?" In the recent case of *Kingston-upon-Hull Corporation* v. *North-Eastern Railway Company*, Mr. Justice Sargant was called upon to decide such a controversy with respect to a combined drain connecting thirty houses belonging to the railway company with a public sewer. The houses abutted on a cul-de-sac, ten being situated on one side of the road and twenty on the other side. The closet accommodation formerly consisted of earth-closets, and prior to 1876 all other drainage was discharged into an open ditch. In that year the corporation, purporting to act under sec. 23 of the Public Health Act, 1875, required the company to make a drain connected with the public sewer in the adjacent highway. The combined drain in question was accordingly constructed. In 1911 a nuisance arose in the drain, and the corporation gave notice to the railway company, under sec. 41 of the Act of 1875, to execute certain repairs. The notice not having been complied with, the corporation did the work themselves, and in this action sought to recover the cost from the company, whose liability, of course, turned upon the question whether or not this was a "single private drain." Mr. Justice Sargant held that it was. In his view the meaning of the section (of the local Act) was that where the drainage pipe provided in connection for a group of houses was as exclusive and private in relation to those properties as the statutorily defined "drain" was in relation to the single house which it served, then the liability of the owners for nuisance arising from that common drainage was analagous to, or corresponded with, the liability of the owner of a single house for the drain serving that house only.

If we may say so with respect, this view seems [illegible] but not unreasonably expressed. Whether it is reconcilable with the *dicta* of the House of Lords in *Wood Green Urban District Council* v. *Joseph* (1907, 1 K.B., 182) is another question. It will be remembered that in that case the learned law lords expressed the opinion that sec. 19 of the Act of 1890 only relates to conduits which owners can be compelled to [illegible] The difficulties attendant upon this interpretation were discussed at some length in our issue of November 27, 1908 (at p. 565), and it appears [illegible] It was, indeed, one of the arguments used by the company's counsel in that case that the corporation could not have compelled the construction of the combined drain because most of the houses were more than 100 ft. distant from the public sewer. We should have thought that this was clearly the case, even apart from the question of the distance of the sewer. It is true that under sec. 23 the local authority can recover the cost of constructing a new sewer from the owners of two or more houses where such cost would be less than that of connecting the houses with an existing sewer. But, so far as we are aware, it has never been contended that this would enable them to require the owners themselves to construct a combined drain which is not to have the status of a sewer. Having regard to the difficulties surrounding this subject, accentuated as they are by the decision in the Wood Green case, we should not be surprised if the decision in the Kingston-upon-Hull case were the subject of an appeal.

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Superannuation at Islington.

The anomalous condition of the existing law as to the granting of superannuation allowances to officers of local authorities has frequently been pointed out in these columns. Certain classes of officers—notably those in the Poor-law service—are entitled to pensions on a scale practically equivalent to that which obtains in the Civil Service; in the Metropolis the Superannuation (Metropolis) Act, 1866 empowers those authorities to which it applies to grant limited superannuation allowances in certain cases; some local authorities have obtained special Parliamentary sanction to schemes for a particular locality; while in the vast majority of cases the power to grant pensions to municipal officers is still entirely wanting. Last year the Islington Borough Council appointed a special committee to consider the question of superannuation in that borough, and the committee have just issued a very interesting report, relating more particularly to the position of the workmen employed by the council. It appears that prior to 1911 certain allowances had been made under the name of "extended sick pay." In that year, however, the auditor expressed the opinion that these payments were illegal as being in fact pensions, although given under the name of sick pay. The council therefore decided for the future to conform to the provisions of the Superannuation (Metropolis) Act, 1866, in all cases. Under this Act, the public authorities to which it applies are given a discretion to grant a superannuation allowance to those who have been in their employment in an established capacity for the prescribed period, on their becoming incapacitated from further service, but the allowance must not exceed the maximum scale prescribed by the Act. It appears that for some time the council have been acting on the assumption that every allowance granted must be on the maximum scale. They have now been advised, however, that this is not the case; and the effect of the recommendations contained in the committee's report is that the council should continue to work under the Act of 1866, and consider each application from either officer or workman on its merits; but that in fixing the amount of the allowance of men entitled to disablement benefit under the National Insurance Act or to old age pensions, the sum granted should be so restricted as not to disentitle the applicant to his State allowance. The Islington report appears to be sound as far as it goes; but we have never regarded the Act of 1866 as satisfactory, inasmuch as it leaves everything to the whim of the council in any particular case. It is to be hoped that the [illegible] pensions of municipal officers and employees may soon be [illegible] by the passing of a comprehensive measure dealing with the whole question.

The London County Council and their Staff.

The General Purposes Committee of the London County Council have recently had under consideration certain representations [illegible] matters affecting the central administrative staff put forward jointly by the Council Staff Association and the National Union of Clerks. The represen-

tations were accompanied by a request for the reception of a joint deputation, accompanied by the secretary of the union. The committee have accordingly been obliged to consider the principle involved in the request that the central administrative staff may be represented before committees of the council by persons not in the service, and they have arrived at the following conclusions: (1) The council and its committees are represented so fully with the exceptional character of the work done, and, in a general way, with the capabilities of the chief of the central administrative staff doing it, that no other body can be so well acquainted, as they are with the requirements of and the best mode to the central staff. (2) The central administrative staff have entered the council's service either by examination or by special advertisement for technical and professional appointments. They are appointed under conditions laid down by the council, which conditions are known to the candidates before entering the service. (3) The selection of a competent administrative staff is one of the most important functions of a governing authority, and depends upon considerations entirely outside the experience of an outside organisation. (4) Every member of the staff is appointed by the council as an officer of the council, and can be dealt with in any material way, either of advancement or retrogression, only by the council, while the discipline of the staff is entrusted to the head of each department. The intervention of an outside organisation would therefore undesirable and unnecessary. (5) The council's system of dealing with its staff is individualistic and based upon the recognition of personal merit, and a distinctive feature of it is that officers in the classified staff are selected to fill some of the higher positions. (6) An association dealing with members of the central administrative staff might seek to exercise influence at elections on questions affecting the staff, and this would in effect transfer from the council matters which can only be effectively dealt with in the light of a knowledge of all the facts. The committee accordingly recommend that a standing order be passed to provide that the intervention of persons not in the service of the council between the council and officers of the central administrative staff other than the minor establishment shall not be permitted. Inasmuch as we understand that representatives of the administrative staff at present have opportunities of placing their views before committees, the recommendation of the General Purposes Committee has, in our view, some justification.

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Local Authorities' Expenditure.

It was reported to the London County Council on Tuesday that the Treasury, having had before them applications for their approval of loans by the county council to the Battersea, Hammersmith, Lambeth, and Wandsworth Borough Councils for the carrying out of electricity, paving and street improvement works, and the provision of sanitary conveniences, express the opinion that capital expenditure by local authorities in the United Kingdom should be restricted within the narrowest possible limits at the present time. Treasury approval, the council are reminded, is now required for all fresh borrowings by local authorities, and it has been intimated to several bodies, in reply to applications, that approval will not be forthcoming in the absence of special considerations for fresh borrowings for the purpose of new expenditure. In the circumstances the Treasury ask that the applications now in question which involve a total outlay of £24,600—may be reconsidered accordingly. As the Finance Committee of the County Council point out in their observations upon the communication, the Government attitude has an important bearing upon the action of the council in regard to its own capital expenditure and its position as a loan-sanctioning authority, as well as upon its action in lending money to metropolitan borough councils and certain other local authorities in London. They are, however, in communication with the Treasury in order to obtain a clear understanding as to their views in regard to the policy which the council should adopt, and they promise to report again after a reply has been received. In the meantime they are withholding from the council the submission of recommendations as to the sanctioning of borrowings by metropolitan borough councils, and they have communicated the terms of the Treasury's intimation to the various committees of the council. They have also abstained from making any further advances of money to local authorities, and have given instructions for the postponement of the completion of any loans which have already been agreed to. In the prevailing circumstances, we imagine that there will be little disposition to criticise the action of the Treasury. In view of the magnitude of the task which lies before the country, every possible and reasonable economy must and ought to be exercised, and it necessarily follows that loans to local authorities must for the present be kept at a minimum.

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A "Sewage-soaked" Welsh Parish.

The motto "Business as usual" points obviously to a worthy objective, and at no time can it be more essential than so far as it affects public health through the agency of sanitation. Dr. T. W. Jones, medical officer of the district of Wrexham, has emphasised its utility by the report which he has written on the housing conditions of Broughton, East Denbighshire, and which was published last week. He gives therein the result of a detailed examination of 1,431 working class houses, and it must be conceded that the picture he has drawn presents many very shocking features. In Moss and Cerney the houses are built on a steep slope, and many of them, on one or more sides, lie deeply against the earth. Some are imbedded up to the eaves on one side, while others are similarly placed to the extent of several feet. Dampness ensues as a matter of course, and when, as is too often the case, this is accompanied by insufficient provision for lighting and ventilation, the result is a rich harvest of chest troubles, tuberculosis, and rheumatism. Tottering houses, due to the subsidence of the foundations, consequent upon colliery workings near to the surface, are plentiful, and in many instances they have been abandoned. In other places the disturbance of the ground has interfered with the cesspools by closing up cracks in the rock underneath, through which the sewage at one time had percolated. The backs of numbers of these houses as a result are being constantly flooded with sewage. The present system of cesspools in Broughton is severely criticised by Dr. Jones. In 141 houses no provision at all has been made for drainage, while in 81 others the arrangements made are far from satisfactory. "When it is borne in mind," he writes, "that the great majority of the cesspools are not constructed on the principles now laid down in the bye-laws, but on the soak-away method, it will be realised that the village is soaked with sewage." Obviously a system of sewerage is called for in certain of the districts dealt with by Dr. Jones, and it is to be hoped that the special committee to which his report has been referred will, by insisting upon a suitable remedy, rescue this part of East Denbighshire from a most unwholesome and scandalous condition.

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The Drainage of Hamilton, Bermuda.*

By G. BERTRAM KERSHAW, M.Am.Soc.C.E., M.Inst.C.E., Late Engineer to the Royal Commission on Sewage Disposal.

The events leading up to the adoption of a new sewerage system for Hamilton may be briefly summarised as follows: The increasing number of visitors from New York and elsewhere to Bermuda caused a marked change in the sanitary conditions obtaining in several of the communities, especially in the town of Hamilton.

It soon became evident that the cesspool system was rapidly becoming overworked, owing to the larger quantity of water used. In many cases overflows occurred, polluting the surface soil; further, some of the smaller hotels, in order to supplement their tank water supply, used well water for baths and flushing purposes. Nearly all these well waters in the town are more or less polluted. In 1910 matters came to a head, and the corporation retained the services of the writer to investigate matters and to report on the best method of dealing with the sewage disposal of the residential portion of Hamilton. These investigations comprised a thorough survey of the town of Hamilton and its environment, the selection of a route for pumping main and outfall sewer, the examination of Hamilton Harbour and the north and south shores, together with float experiments and various other matters. The outfall sewer from Prospect Camp was also visited.

There are no 25-in. ordnance sheets of Bermuda; consequently, enlargements were made of Lieutenant Savage's 6-in. survey. Several fresh surveys of portions of Hamilton and the vicinity were needed owing to alterations carried out subsequently to the original survey.

With respect to the existing cesspool system, it was found that the liquid from the cesspools had percolated through the limestone to the subsoil water—which lies on a sub-stratum of salt water—and had polluted it.

The purification which the liquid from a cesspool undergoes—in addition to the mere straining-out of solids—must depend upon its receiving sufficient oxygen for the oxidation of the organic matter and ammonia present through the agency of aërobic bacteria.

The level of the water-table underlying Hamilton was found by measurement to rise and fall with the tide, and it is possible in some wells to draw comparatively fresh water from the surface and salt water from the bottom of the wells.

It was pointed out to the local Board of Health that no sewerage system for Hamilton could be regarded as complete, or even satisfactory, unless, while meeting the more urgent and present needs, it also included provision for future extension, so as to include the whole of the city area. . . .

The sewerage scheme was drawn up on this understanding, and divided into two sections: (1) A sectional scheme, dealing with the area lying mainly south of Church-street, and (2) a sectional scheme auxiliary to this, serving the northern area, which could easily be carried out at a later date. It was found that a gravitation scheme throughout was impracticable, but that all the southern area, with the exception of the Princess Hotel, could be served by sewers gravitating to a pumping station placed on the harbour front, while the northern area could be gravitated to a small auxiliary pumping station on a plot of ground north of the Hamilton Hotel, the sewage to be raised on the completion of the scheme to the manhole adjoining the Hamilton Hotel.

Regarding the prospective quantity of sewage to be dealt with, it was found that, allowing for future increase in population and visitors, a total dry-weather volume of sewage of some 150,000 gallons might be anticipated every twenty-four hours.

Special emphasis was laid upon the necessity of ample and frequent flushing, and for this purpose it was proposed to utilise sea water pumped from the harbour to a storage tank placed on high ground to the north-west of the town. It was evident throughout the investigation that any question of discharging sewage into Hamilton Harbour was absolutely out of the question. Such a course would, with the high temperatures obtaining—both as regards atmosphere and sea water—together with the presence of *ulva*, have been productive of an intolerable nuisance.

Examination of the north shore showed it to be unsuitable for the discharge of sewage other than in very small quantities owing to the slackness of the currents and their direction. Moreover, the height to which the sewage would have required pumping would have been very considerable. The south shore, on the contrary, was well adapted for the discharge of sewage. The water in the vicinity of Hungry Bay was deep fairly close in to the shore, there was a considerable swell, even on a calm day, and it would have been practically impossible for *ulva* to have established itself there. The most suitable position for the outfall was found to be a point just west of Hungry Bay, and a series of float experiments carried out prior to my arrival, in conjunction with experiments made by myself during southerly and south-westerly winds, showed that the set of the current on the south shore was eastward during flood tides, while during ebb tides it was westward. It was further found that the small headland at the mouth of Hungry Bay had the effect of deflecting the flood-tide current seaward, clear of the bay.

This outfall site possessed the additional advantage that at a short distance from the cliff there was an excellent site for tanks, with ample fall, which could be utilised, if in the future, owing to an abnormal increase in population, or some other unforeseen circumstance, it should become desirable to treat the sewage before discharge. The best site for the pumping station was found to be almost at the edge of the harbour. Owing to prospective extensions of wharves the available site was very restricted, and just before the work was put in hand the site was moved some 30 ft. to the east to make room for wharfage and buildings.

The selection of the route for the pumping main and outfall sewer was a matter of considerable difficulty, owing to the very hilly and uneven character of the country, and also because it was necessary to reduce the cutting as far as possible—all of it being in rock—and to carry the pumping main from the pumping station to the summit of the outfall sewer in such a manner as to avoid possibility of airlocks.

The report was submitted, and the vote in favour of its adoption was unanimous, the corporation deciding to carry out the work themselves without contractors, while retaining the writer to prepare the necessary drawings and to supervise the carrying out of the work.

All the materials used in the work were manufactured in and sent out from this country.

Mr. J. H. Dale, formerly of the Royal Engineers, was appointed resident engineer, and the actual work was commenced in 1912.

SEWERS.

These were constructed of best quality socketed salt-glazed stoneware pipes, of diameters ranging from 7 in. to 12 in., and were manufactured by Messrs. Doulton & Co.

All excavation was in the limestone rock, and was carried out with picks, mattocks and wedges, with occasional blasting. The sewers were bedded on the rock, recesses being cut for the sockets, the pipes being packed up and surrounded with fine material before filling was commenced. Where the ground was bad the pipes were surrounded with fine concrete. Special care was taken in filling the trenches to keep the larger fragments of rocks at or near the surface of the trenches.

All the sewers have good grades, the following being minima for each diameter of pipe: 7-in., 1 in 190; 9-in., 1 in 59; 12-in., 1 in 359.

MANHOLES.

The construction of the manholes and flushing tanks varied according to circumstances. Where good solid rock was encountered this was utilised to form a portion of the manhole walls, the sections opened out by the sewer trenches being walled in with masonry and the whole of the interior of the manholes rendered.

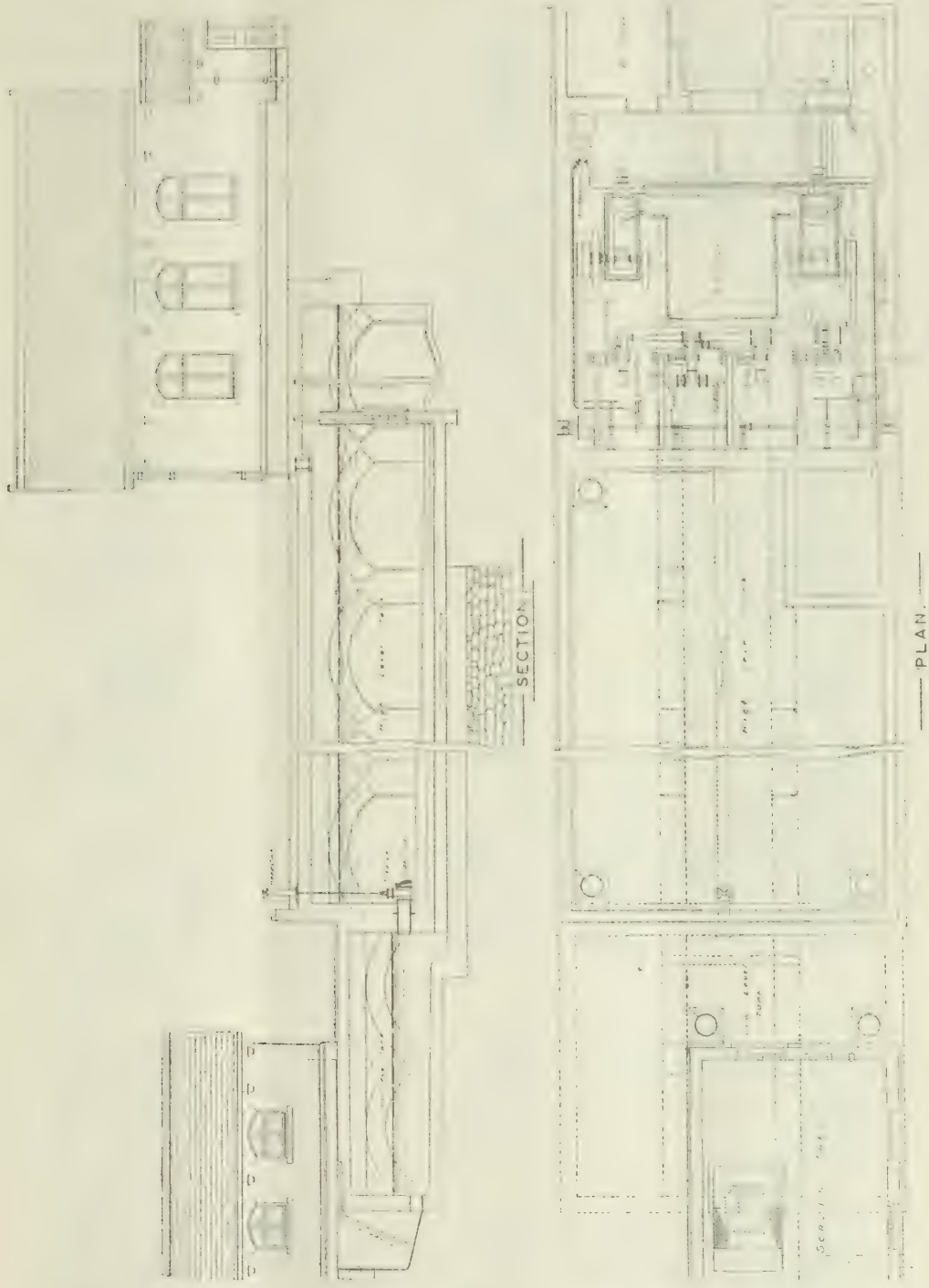
When bad ground or sand pockets were met with, the manhole was either constructed entirely of con-

* From a paper read at the last meeting of the Institute of Sanitary Engineers.

side or manner, or alternatively the bad portions were cut out and made good with cement concrete. Reinforced concrete slabs were used in lieu of the usual Yorkshire flag coverings.

heavily gravelled. The whole of the ironwork was supplied by Messrs. Ham, Baker & Co.

Four hundred and ten automatic flush tanks were provided to all dead ends of sewers, and were made


SECTION
PLAN.
J. A. F. HAMILTON, SEWERAGE ENGINEER. SECTION & PLAN OF AUTOMATIC FLUSHING TANK.
G. Bertram Kershaw, M.Inst.C.E., M.Inst.S.E., Engineer.

The manhole covers used were of the heavy pattern "ventomot," with 22-in. opening in the clear, without wood blocks, and provided with stout galvanised dirt boxes. The foot irons were of malleable iron,

any to ensure heavy and frequent flushing. These tanks are fed by 3-in. diameter branches from a 2-in. cast-iron main, connected up to a storage tank placed on high ground. Sea water is used for flushing pur-

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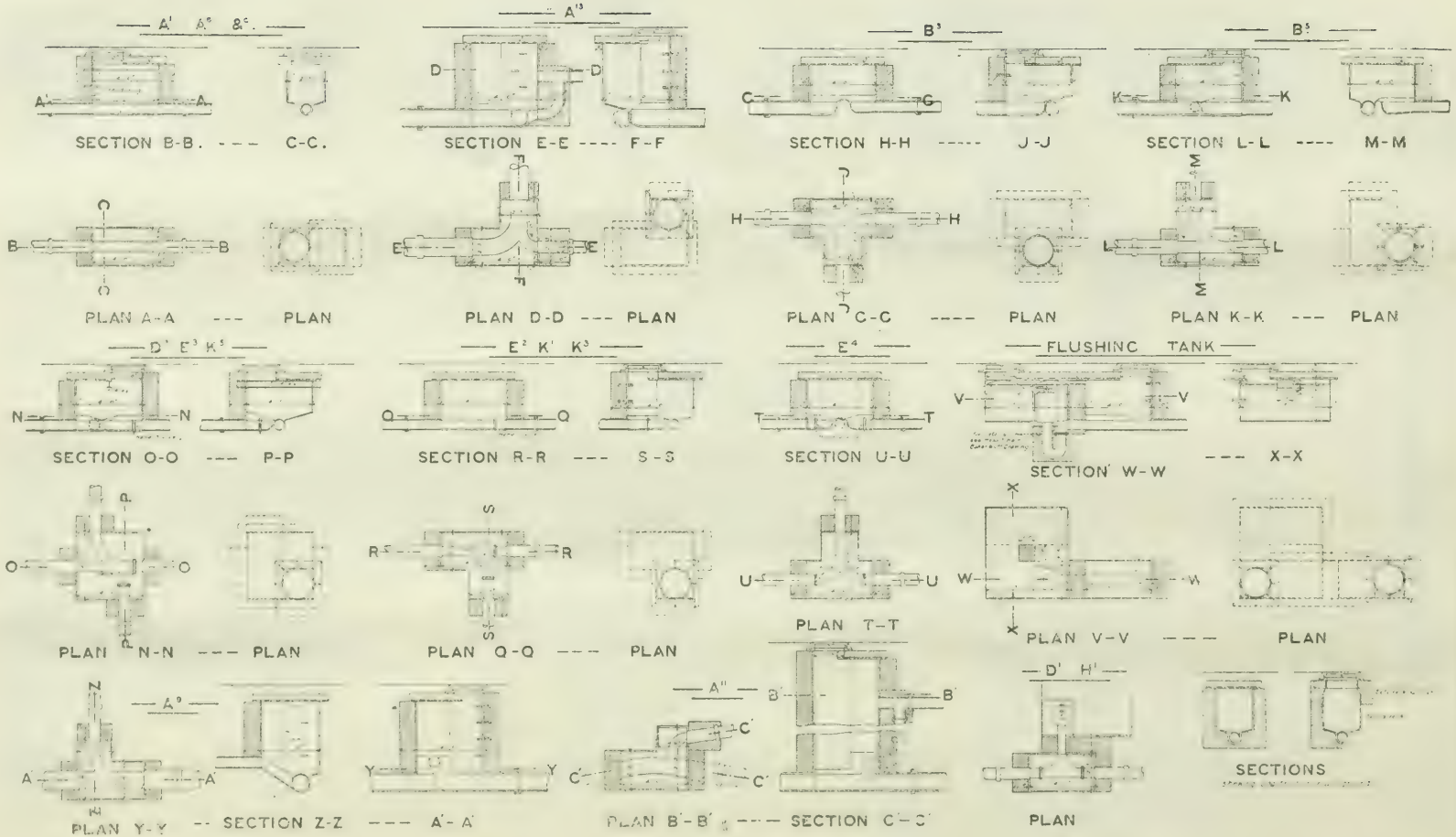


City of Hamilton Sewerage: Manholes.

H. Bertram Kershaw, M.A.M.Soc.C.E., M.Inst.C.E., Engineer.

pose being pumped up to the storage tank by a small twin centrifugal pump at the pumping station. The storage tank is provided with a by-pass valve, so that the pump may discharge direct into the sea, and it has a capacity of about 7,000 gallons. The flushing tank is constructed of reinforced concrete, and is connected to both sewers by means of 6-in. cast-iron pipes with valves at the storage tank.

Disc penstocks are provided in certain manholes to facilitate flushing in either direction.

Ventilation of the sewers is effected by means of ventilating columns, 25 ft. in height, placed at the highest points of each sewer. The shafts are 6 in. in diameter, galvanised, and stand on cast-iron bases 4 ft. high. They are provided with rust pockets, screw caps, and wire cages.

Surface water is carefully excluded from the sewers, and there are no storm overflows. Water is a valuable commodity in Bermuda, and steps are taken to conserve it in every possible way.

Before the sewage enters the suction tank it passes through a covered-in screen house, provided with a hand-raked screen set at an angle of about 30° with the vertical, the bars having ¼-in. spaces between them. The screenings are removed from the screen several times daily by hand raking.

SUCTION TANK.

The suction tank has been excavated in the limestone rock, and owing to the presence of soft pockets and the fact that a portion of the work to be carried out was below the level of the sea, great difficulty was experienced in keeping out the sea water. Further, gelatinous silicates were formed by the action of the sea water on the cement mixed with the concrete to fill the sand pockets. All the smaller pockets were dealt with separately, but with two very large pockets occurring near the centre line of the tank, a special type of trench was made, and an 8-in. centrifugal pump installed over the pocket, but failed to keep the water down.

Eventually it was decided to divide the tank into two sections, by means of the dividing wall, which was in position when the work was started, the tide level, but raising the floor of the remainder of the tank about 12 in., and extending it slightly eastwards to equalise the tank capacity, and thus balance the weight of the concrete and bring the tank on to solid ground. Further, two steel girders encased in fine concrete were placed across the west wall of the upper tank to take the weight of the pump foundations. The large sand pocket was excavated to a depth of about 4 ft. and packed with bags of fine concrete, well keyed under the side walls of the tank, hand-packed rubble being well rammed in 3-in. layers over the whole of the tank floor. A reinforced concrete floor 12 in. in thickness was placed over the rubble. The work was carried out in sections, and proved a lengthy undertaking. The reinforcement was introduced owing to the risk of fracture by earth tremors or salutes from gun firing coinciding with a period of high tide. It consisted of ½-in. iron rods laid both longitudinally and transversely to 12-in. centres, 3 in. from the underside of the concrete flooring, with the ends bent over and well embedded in the concrete at the sides of the tank, while a layer of expanded metal 3-in. mesh by ½-in. by 3 gauge was laid 3 in. beneath the surface of the concrete floor. The walls of the tank were formed partly in concrete and partly in solid rock, all the interior of the tank being rendered.

The piers and arches were formed of concrete.

The alteration to the tank necessitated laying a 12-in. pipe under the larger tank to the first compartment, terminating in a stand-pipe. A 12-in. pipe furnished with a tide flap and sluice valve was also built through the partition wall dividing the two tanks, and water-level indicators were provided in each tank compartment. The total combined capacity of the two tanks is about 90,000 gallons.

Pumping is carried out at present on the ebb tide only. When the water level in both tanks reaches 3·75 ft. above ordnance datum, the sluice valve connecting the two to the high-level tanks is closed and the contents of the low-level tank pumped into the high-level tank by one of the 4-in. sewage pumps. At the proper time, regulated by the state of the tide, the sluice valve on the pump delivery to the suction tank is closed, the valve to the pumping main opened and the sewage pumped to the outfall. The suction tank is swept down at least once every week, and all accumulated silt pumped to the outfall.

OIL ENGINES AND PUMPS—MACHINERY.

The question of utilising electrical power for pumping was fully gone into before deciding upon oil engines, and it was found that the balance as regards running cost and reliability was greatly in favour of the adoption of oil engines.

The engines are in duplicate, Messrs. Ruston & Proctor & Co.'s refined-oil engines being used. They are capable of developing 28-b.h.p. constant working load, with 31-b.h.p. maximum load, and will burn either crude or refined oil. Each engine is amply powerful enough to drive any two of the sewage pumps, or one sewage pump and the salt-water pump.

The countershafting consists of 2¼-in. diameter mild steel, with collars and coupling, supported by wall boxes and three wall brackets and bearings. This shaft takes two pairs of fast and loose pulleys to take the main drive from the engine, three pulleys to take the drive to the sewage pumps, one pulley to take the drive to the salt-water pump, and pulleys for the circulating pump and air compressor. A self-starter and a charging pump common to both engines are provided, and an extra large cooling water tank with circulating piping to the engines, together with circulating pump driven from the line of shafting.

The pumping machinery consists of three 4-in. centrifugal pumps, each capable of delivering 300 gallons of sewage per minute against a total head of 75 ft. including friction, and each complete with fast and loose pulleys, striking gear, rotary exhauster, sluice valves and suction and delivery pipes and bends. The salt-water pump supplying the storage flush tank is a 2½-in. twin centrifugal pump capable of lifting up to 120 gallons per minute of salt water against a total head of 120 ft.

RISING MAIN.

The rising main from the pumping station is of cast-iron pipes 10 in. in diameter. As showing the nature of the ground through which this main had to be carried, it may be mentioned that at one point it is recessed into the face of a disused quarry. Lead wool was used for jointing the pipes, and it was found satisfactory in all respects. In one place where "made" ground occurred for a distance of about 120 ft., sinkings were made down to the solid rock and the pipes were supported upon concrete piers. The main was tested to a head of 150 ft. (65 lb. per square inch), the pressure being maintained for fifteen minutes.

SEA OUTFALL.

The outfall down the cliff into the sea is formed of ball-and-socket pipes, and these extend seawards for some 40 yds. from the cliff face. They were laid in a channel formed in the solid rock floor by blasting, and were packed with bags of 1 to 1 cement concrete, laid as far as possible level with the natural surface of the rock. The pipes, where exposed to the sea water, were treated by the Bower-Barff process as a protection. The precise position behind the protecting reef was chosen by reason of the fact that sand was never observed to lie there. Moreover, the reef has the effect of partially checking the velocity of the heavy bodies of water which dash against and over the cliff during gales. The end of the outfall pipes is covered by about 4 ft. of water at lowest tides.

COST.

The total estimated cost of the work was between £12,000 and £13,000. The final cost cannot yet be given, but there are good reasons for believing that the actual cost will be slightly under the estimate.

Although all the house connections have not yet been entirely completed, the pumping machinery has now been in use for some months, and has gone perfectly smoothly. Tests have been carried out since the works were completed by means of dyes placed in the suction tank, and they have confirmed the results of the float experiments, the sewage keeping well out from shore, even with heavy southerly winds.

The Progress of Cremation.—The annual report of the council of the Cremation Society of England states that the number of cremations at Woking during 1914 was 124, as compared with 128 in the previous year, while the figures for Golder's Green are 671 and 602 respectively. Thus the total cremations in 1914 amounted to 795, as against 730 during 1913—a growth of 9 per cent. The corresponding statistics for Great Britain are 1,189 and 1,279—showing an increased percentage of 8·9.

Some Notes on Wind Pressure.*

By R. GRAHAM KEEVIL, A.M.I.MECH.E., M.C.I., Works Department, Admiralty,
Lecturer on Ferro-Concrete at the Northern Polytechnic.

It may be said that our modern knowledge of wind pressure extends backwards only so far as the destruction of the original Tay Bridge in 1879. This bridge was part of the scheme for bridging the two firths—Forth and Tay—which was brought to a successful completion by the construction of a new Tay Bridge and the erection of the Forth Bridge; the latter, by the way, has been opened for traffic for twenty-five years to-day.

On December 28, 1879, while a train was on the bridge and a "gale of exceptional severity was blowing," one or more of the piers gave way, bringing down eleven 245-ft. span and 227-ft. span girders, precipitating the train and seventy-four people into the Tay. The subsequent Board of Trade inquiry showed that opinion among engineers about wind pressure was in a state of chaos. An endeavour was at once made by a Board of Trade Committee to put matters on a satisfactory footing. After examining wind records, they, on May 20, 1881, recommended: "That for railway bridges or viaducts a maximum wind pressure of 56 lb. per square foot should be assumed for the purpose of calculation." This immediately came into force for railway work, and was also adopted generally for structures on public works, although such adoption was purely arbitrary, or specified in local by-laws.

Much opposition was raised to this standard of pressure, because it was considered excessive and not justified by experience of existing structures. As far as buildings are concerned, the horizontal pressure assumed for designing has gradually been reduced to the 30 lb. per square foot, now often taken.

QUESTIONS OF IMPORTANCE.

Two questions of great importance arose, and these have since been practically settled by research—viz.:—

(*a*) Where the wind velocities given by the anemometers then in use correct?

(*b*) What was the relation of wind velocity to wind pressure?

There are three methods for the measurement of wind:—

(1) Velocity measured by the Robinson anemometer.

(2) Pressure measured by a pressure tube anemometer.

(3) Pressure measured by a plate or board set face to the wind.

Considering (1), the anemometer that bears his name was invented by Dr. Robinson in 1846, and is by far the most used of the various instruments which have been produced from time to time. It consists of four arms at right angles; at the end of each arm is a hemispherical cup. This instrument measures direct velocity, and Dr. Robinson, after experimenting, stated that the velocity of the cups was one-third the velocity of wind for all instruments, whatever their size. This is now known to be a fallacy, with the result that practically all records prior to 1902 were incorrect and generally much too high, a fact which justifies the distrust shown by the experts at the Tay Bridge inquiry respecting the records quoted then.

The discovery that the factor 3 for the Robinson anemometer was incorrect is due to the experiments carried out by Mr. Dines, and since confirmed by other authorities. These experiments consisted of placing anemometers on horizontal arms, which were rotated by means of a steam engine; 14½ revolutions of this "whirler" constituted half a mile of space, while great care was taken to ensure accuracy in the results. The number of turns of the whirler and the revolutions of the anemometer, both of which were counted automatically, determined the relation between the distance travelled and the revolutions of the anemometers, and thus the value of the new factor 2·2 was obtained.

The outcome was that the Wind Force Committee of the Royal Meteorological Society in 1902 adopted the factor 2·2 instead of 3 for the standard Robinson anemometer. Thus, when the old factor was used, and the instrument indicated, say, a velocity of 60 miles per hour, the use of the new factor reduced the velocity to 44 miles per hour. Converting these velocities into pressures by the formula $P = 0{\cdot}003\,V^2$, the 60 miles per hour velocity gives 10·8 lb. per square foot, while the velocity of 44 miles per hour gives a pressure of 5·8 lb. per square foot—a very serious alteration, which doubtless explains the fact that chimneys, buildings and bridges which by all the rules of the anemometers should have fallen down are standing until to-day, or meeting an honourable end by the hand of housebreakers. This rotating anemometer has one great disadvantage in that, owing to the inertia of the instrument, it does not record gusts of wind which may have a much greater velocity than the average values shown by this instrument. For instance, if the record is, say, 37 miles per hour, it shows that the cups have passed through a distance of 37 miles in the hour; at some part of the time they would be revolving faster than at others, but the record shows the average speed.

Another type of instrument is the pressure tube anemometer invented by Mr. Dines. This instrument automatically records all the varying pressures of the wind, and consequently all gusts and lulls that occur during a gale, whatever the velocity of the wind may be. The principles upon which the design of this instrument is based are that when the wind blows into the open horizontal mouth of a tube it causes an increase of pressure within it and in all airtight arrangements connected with it. On the contrary, if the wind blows horizontally across the open mouth of the vertical tube, the column of air within the tube rises and the pressure is reduced within it and in all airtight arrangements connected within it.

The third type of anemometer is like the second type, a pressure recorder, and is in general use, although now practically obsolete. This type consists of a board or plate which, by means of a weather vane, is kept facing the wind. The back of the board is fitted with springs, which keep the board up to its work. The wind acting on the face of the board drives it backwards, compressing the springs; the pressure is then measured and recorded automatically by the movement of the board or the compression of the springs. This type of instrument has been in use for many years, and, like the Robinson anemometer, the earlier forms recorded pressures which are now known to be erroneous and much too high. The cause of the high pressures recorded up to 60 lb per square foot and over was faulty design and the momentum of the moving parts. The result has been that high pressures have been recorded and quoted by authorities, when as a matter of fact the actual pressure was something less than half those shown.

FORTH BRIDGE EXPERIMENTS.

This type of pressure board was used at the Forth Bridge during its construction. When Sir Benjamin Baker, in connection with Sir John Fowler, undertook the responsibility for this great structure, it became necessary to ascertain as nearly as possible what would be the probable wind pressure on the bridge in the exposed position on which it is sited. He accordingly erected on the top of the Old Castle on Inchgarvie three anemometers; the principal one was 20 ft. long by 15 ft. high, approximately the size of the side of a railway carriage of those days, erected vertically with its surfaces facing east and west, this direction being the most unfavourable from which the wind could strike the bridge. The board was hung in a frame and fitted with four springs at the four corners to adjust the board to its normal position. The movement of the board was communicated to the registering apparatus by means of wires. In order to ascertain to some extent the effect of small local gusts, plates 18 in. in diameter were fitted in holes cut out of the centre of the board, and at the top right-hand corner, and arrangements made to register the pressure on them separately. A circular plate with an area of 1½ sq. ft. was erected to face in the same direction, and 8 ft. away from the large board, and provided with means for registering the pressure. The third was a revolving gauge, also with an area of 1½ sq. ft., and fitted with a vane so that it always faced the wind.

* Abstract of paper read at the last meeting of the Concrete Institute.

These anemometers, although giving good results, were not intended to give very accurate results. The records of the violent gales showed that the average on the large board was 0·565 of the average on the small gauge, and that the average on the large board was 0·592 of the average on the revolving gauge. If we round these figures up we can say that the pressure on the large board is five-eighths the amount shown by the small gauges, a fact to be remembered when considering the records from the small anemometers in general use, and applying them in design of buildings of large exposed area.

After the completion of the bridge five revolving gauges with a plate area of 1½ sq. ft. were fixed on the bridge, and a continuous record was obtained.

These results from the Forth Bridge are interesting and valuable in that they show records of an exposed position and at considerable differences in height and width. From a consideration of them with other reliable information now available, they appear to be high in value, and to be influenced by gusts and possibly by some momentum of the plates of the anemometers.

The most valuable information available respecting wind velocities is undoubtedly that given by Dr. Shaw in his report on the Beaufort scale of wind force, which is compiled from the records of the anemometers at various meteorological stations. This information shows the number of miles of wind exceeding 37 statute miles in the hour, grouped according to the maximum hourly velocities recorded by Robinson anemometers. The point that is most striking after a study of the records is that pressures over about 12 lb. per square foot are rare. It must be borne in mind that these records are averages, and that individual gusts would give higher pressures on small areas.

Dr. Shaw, in his reports and memoranda, No. 9 compiled in connection with the Advisory Committee for Aeronautics, defines "the ordinary 'gustiness' of a steady wind" as the "variation of the velocity and direction of the wind, while the average hourly velocity remains practically unchanged, or increases or decreases gradually. The intervals of these gusts are of the order of some fraction of a minute; they are largely a question of exposure of the anemometer."

COAST AND INLAND WINDS.

The relation between coast and inland wind is a practical question which often arises when an important structure is to be designed in some locality where building regulations are of an elementary character, or non-existent, and where the only guide is the possession of reliable information, such as that already quoted, but which has been taken at one or more exposed stations near the coast while the proposed structure may be sited some distance inland. Dr. Shaw says that, "speaking from the daily experience of weather maps, we may say that a westerly wind of force 8 at an exposed western station will be represented at an inland or east coast station by a wind force of 5. The corresponding reduction in velocity is from 42 to 21 miles per hour. Provisionally, therefore, we may say that the surface wind velocity (that is, winds that will affect a structure) at a reasonable well-exposed station inland, or at a coast station for an off-shore wind, is reduced to one-half the velocity of an open coast station. As pressure is dependent on velocity, it follows that the pressure will be reduced to a corresponding amount.

When dealing with a building of large exposed area there is often a difference of opinion, in the absence of regulations, as to what wind pressure to adopt—i.e., the maximum average velocity or the greatest gust. There is little available information as to what may be termed the area of a gust, but it is considered to be comparatively small. In a well-designed and well-constructed structure, it would appear to be good enough to take the maximum velocity, and trust to the continuity of the structure to distribute local gusts.

The presence of windward and leeward pressures on experimental boards and structures has been known for many years, and many experimenters and writers have dealt with it. The windward pressure is, of course, caused by the wind striking on a surface exposed to it. The leeward pressure appears to be caused by the flow of air round the edges of the obstacle, tending to draw some of the still air behind with it, and causing a partial vacuum. The direct pressure and the suction of the vacuum must be added together in order to arrive at what is known as the total pressure. Up to the present, assumed wind pressures, which are undoubtedly excessive, have been in general use for designing, and very safe structures have been the outcome; but with the advance of knowledge, the very heavy structures now common will gradually give place to more scientific designs, and a corresponding saving of material. New methods now being evolved will then become of the greatest importance.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it not [illegible] that, while on the one hand the police throughout the country are rigidly enforcing the regulations against bright lights on motor cars, they are absolutely ignoring the requirement that all vehicles must carry red rear lights? Are not very serious accidents likely to result from this extraordinary proceeding?

. . . .

If some of us cannot quite agree with the conclusions arrived at in the recent American report on "Bituminous Materials for Road Construction," shall we not all agree that if a report, on the same lines, could be compiled [illegible] Road Board it would be a great benefit to the community of this country? Shall we not also agree with the statement in the above-mentioned report that there is no [illegible] that every case must be carefully considered in the light of traffic, climate, surroundings, and so forth? Would the road engineer be required any longer if a "universal remedy" could be found?

. . . .

Is it not rather curious that in such an apparently simple matter as the fixing of the right position of [illegible] failures? Was not the article in last week's issue of THE SURVEYOR just the very thing that is needed, and one which should be read by every surveyor in the country? Have we not all suffered in our day from the difficulty of "spotting" the direction given [illegible] we sufficiently realise that attention to small matters [illegible]

. . . .

Is it not greatly to the credit of Mr. Noble Twelvetrees, M.I.MECH.E., that he should have been instrumental in persuading the Commandant of the City of London National Guard to form a special corps of engineers as a unit in that well-organised and excellent force? Is it not to be hoped that every engineer who is over forty years of age, but still physically fit, will join this corps, and thus set an example to the many who are not doing their share [illegible] Is it not a fact that in joining this corps the times of drill, &c., are so well arranged that even the busiest man can find time to make himself efficient without encroaching on his office work?

. . . .

Why is it that some municipal authorities will try to interfere in the question of the taking of pupils by their surveyor? Is it not only common sense that if a pupil is forced on the surveyor it would be most unfair to the pupil and his chief, and that if, on the other hand, the "authority" prevent the surveyor from taking a reasonable number of pupils, the country as a whole must suffer from a scarcity of properly trained municipal engineers?

. . . .

Is it possible that at last there is a prospect of rubber entering into the composition of the material of which road surfaces will be constructed in the future? Does it not look as if there is now a likelihood of this when we see in the public Press that a company "Rubber Roadways, Limited" has recently been formed with a capital of £90,000, to carry on business in connection with the use of rubber for road making? Is it not evident that if this material can be economically used in road construction there should be a future for this company?

. . . .

Is it not curious to note that at Long Ditton Church there is a monumental brass, said to be of about the date 1500, in memory of John Haymer, a former rector, of whom it is stated that he was a "benefactor to the poor and to the highways," also another brass, dated 1527, to one Robert Castleton, who directed his executors to "ley or cause to be laide in Ditton Strete in the church path oon hundred load of gravelle wt in the space of thre yeares after my decesse"?

Tree Planting in Streets.

EXPERT'S REPORT TO KENSINGTON BOROUCH COUNCIL.

At the request of the Kensington Borough Council Prof. J. B. Farmer, M.A., D.Sc., F.R.S., F.L.S., of the Imperial College of Science and Technology, South Kensington, has prepared for that authority a report on the matter of tree planting in London streets.

In his preliminary observations Prof. Farmer remarks that trees which are growing in streets are placed under highly artificial conditions. They cannot be expected to flourish as they do in the country, and it would not be practicable to allow them to do so even were it otherwise possible. It may, he thinks, be admitted as an axiom that the trees are planted there primarily for the sake of the streets, although it sometimes seems as if the streets exist rather for that of the trees; but they ought to form part of the architectural scheme, and should be selected and grown in accordance with this principle. While enhancing, as far as may be, the amenities of the locality, they ought to be so planted as to cause the least possible inconvenience both to the inhabitants and the users of the street. These objects can be realised by securing the right sort of tree, by keeping it within proper limits of size, and by dealing with each street as a whole on a definite plan, the details of which have been fully thought out and arranged beforehand.

The writer of the report says there is room for divergence of opinion on matters such as the choice of the species or the shape to be aimed at, but that whatever decision is finally arrived at on these or other points, it should be rigidly adhered to as governing the treatment of the whole length of a street or road—at any rate for so far as the planting may extend. It should be frankly recognised that any consistent scheme of street planting is bound to be on the lines of formal gardening—*rus in urbe* is not a practical proposition, save in a very restricted sense—and a "natural growth" is commonly unsuited to all but the widest thoroughfares or avenues, and even in them a limit is soon reached when, if the trees be allowed to extend further, they become a nuisance to at least some of the inhabitants. Many streets have been completely spoiled through the ragged appearance caused by the removal or severe lopping of a few of the trees as the result of complaints, which are in themselves reasonable enough, but for which grounds need not have been given.

CHOICE OF TREES SUITABLE FOR PLANTING.

"In London," Prof. Farmer continues, "the number of species that can be planted with any prospect of a satisfactory result is very limited. Not only must they be able to stand smoke and fog, but they must be amenable to pruning, and readily assume a suitable shape. Nevertheless, the improved atmospheric conditions that now prevail as compared with those of a quarter of a century ago render it possible, and I venture to suggest even desirable, to experiment with promising subjects. In this way the monotony that threatens the London streets, owing to the almost exclusive use of the plane, will be obviated." The report proceeds:

The London Plane (*Platanus acerifolia* Willd).—Without doubt this is the most useful tree for planting in a city like London. It will grow in almost any kind of soil, and can withstand the bad conditions of aëration that exist under stone or concrete pavements. Its healthiness, as well as its clean appearance, tends to be maintained owing to the manner in which it gets rid of much of its smoke-begrimed bark by shedding the scales every year. It stands pruning, and even the hardest cutting back, better than almost any other tree, except, perhaps, the lime. But it needs attention in order to prevent its naturally vigorous development rendering it unsuitable for the area at its disposal. It also labours under the suspicion of causing injury to the respiratory organs of delicate people, owing to the hairs which are shed by the leaves as they reach maturity, and still more to the stiff bristles that easily break off the ripe fruits, and so get carried in the air. I do not think the case against the tree on this account has been really proved, but it is a fact that in some foreign towns, particularly in Germany, it has fallen into disfavour.

The Lime (*Tilia europaea* L.).—There are several forms of lime included under this name, and they are often to be seen as urban trees. They are hardy, and submit to pruning, but they all exhibit qualities that, in my judgment, render them unsuitable for streets. During periods of prolonged drought they are apt to throw their leaves prematurely, and thus to assume a dreary autumnal character even during the height of summer. Furthermore, they are particularly liable to attacks of aphides, and these greatly increase a natural tendency to produce a drip known as "honey-dew," an excretion which makes the pavement beneath a tree both sticky and filthy. But there is another species of lime—*Tilia euchlora* C. Koch, which has been planted with success on the Continent, and is free from the disadvantages of the common lime. It appears to be thoroughly well worth a trial in London. It is a very beautiful tree, with large, bright green leaves. It seems to be quite free from the aphis trouble, and it would, if successful, form a very valuable addition to the small number of trees available for street planting. I would suggest that it should be tried in a few of the shorter streets as an experiment that is well worth carrying out.

The Tree of Heaven (*Ailanthus glandulosa* Desf.) is not always planted with satisfactory results. I think this is largely owing to the lack of attention in training and shaping that the young trees too often receive. It is a handsome tree, with a well-marked character, and as it stands cutting well, besides being a good grower, it is really well adapted for street planting. It should be borne in mind when purchasing the plants that the tree is unisexual—that is, male and female flowers are produced on different individuals. Only the female tree should be planted, as the male flowers have a most unpleasant odour.

The Elm (*Ulmus*) is represented by several species, most of which, although making good specimens for parks, are quite unsuitable for the street. This is partly owing to the large size and free growth needed to make good and ornamental specimens, but partly also to the dangerous habit they have of throwing off large branches with little or no warning. There are two sorts which have merit for urban purposes—viz., the Cornish and the Jersey elms. The Jersey elm (*Ulmus stricta* var. *Wheatleyi*) is the better of the two. It is of erect habit, and naturally assumes the pyramidal form which most trees have to be pruned to acquire. But elms should not be retained when they become old on account of the shedding of the branches, to which attention has already been drawn.

The Ash (*Fraxinus excelsior* L.).—There seems no reason why this tree (especially the variety known as *Monophylla*) should not be planted in streets of sufficient width. The light foliage is a distinct advantage, but the ash requires a good, heavy soil, and does not stand drought. If its requirements in these respects were met, there seems no reason why so beautiful a tree should not be utilised in the damper localities, although some difficulty might be experienced in obtaining the variety in any quantity.

The Horse-chestnut cannot be recommended for street planting, as it is naturally too large, and does not lend itself readily to cutting; but a pink-flowered hybrid, known as *Aesculus plantierensis*, forms a beautiful tree, and might be tried in a street where the houses are set back from the pavement, so that they would not be unduly shaded. An advantage which this hybrid possesses over the common as well as the red chestnut lies in the circumstance that it produces no fruit, and thus escapes the attentions of boys.

The Poplar.—There are two kinds worth considering in connection with the subject of this report. Both of them are pyramidal sorts—one the Lombardy poplar (*Populus nigra* var. *Italica*), the other is known as Bolle's poplar (*Populus Bolleana* Carr.). This latter tree somewhat resembles the well-known Lombardy poplar, but is of a wider and better shape, with the leaves white or silvery beneath. Poplars require a moist soil, and if this point were attended to they ought to flourish fairly well.

I am aware that they have failed in some streets where they have been tried, where, in addition to unsuitable soil, they had to contend with a leaky gas pipe; but on heavy soil, given moderate attention, they ought to thrive, and their peculiar form is especially appropriate in streets in which a freer-growing species might be out of place.

The Acer Pseudo-platanus is sometimes planted as a street tree, but, although very beautiful when well grown, I think its habit of littering its leaves through the summer, coupled with its rather straggly habit and somewhat brittle wood, render it unsuitable for this purpose.

IMPORTANCE OF REGULAR SPACING.

Whatever species of tree be decided on, it is of the utmost importance that the planting should be conducted on a properly arranged plan. . . . The trees are best planted from 50 ft. to 60 ft. apart; they should not be closer together than 45 ft., nor should the upper limit of 60 ft. be greatly exceeded, except under special circumstances. The practice of planting at very short intervals, with the intention of removing every alternate one later on, has but little to commend it, and in any event it is very wasteful. I may, perhaps, be allowed to suggest that the planting plan should first be drawn out on a large-scale map, as it would then be possible so to arrange the spacing in relation to the cross roads, and any structural features affecting the distances apart of the trees, as to disturb the regularity of intervals as little as may be. The actual distance between the trees is, within reasonable limits, far less important than the securing of a good general effect such as can only be obtained by a fairly uniform spacing. Another point to which I would venture to draw attention is that in streets where the houses have forecourts the effect of planting in the road would be finer if the owners of the houses could be induced to cease growing trees of their own in their frontages.

As a general rule the streets most suitable for trees are those which run north and south. The trees on both sides of the road receive their due share of sunlight, and the houses on neither side are unfairly deprived of their light. In streets running east and west the trees are apt to become a nuisance to the people who live on the north-facing side of the road. Of course, this must not be interpreted too strictly, as it obviously applies but little to roads that are of considerable width. . . . And in this connection it may be questioned whether trees ought ever to be planted in streets of less than 50 ft. in width. They would have to be kept very small, and it would probably be unwise to deprive the houses of any of the light and air which they are able to receive.

SIZE OF TREE AND SEASON FOR PLANTING.

While the size of tree is determined by what can be obtained from the nursery—and this will vary with the species to be planted—where possible trees from 12 ft. to 16 ft. high is suitable, although plane trees of a still larger size can be bought and safely transplanted if they are procured from a good nursery where they are frequently moved so as to keep a compact ball of roots. Care should be taken to see that the young trees are symmetrical, and that they have not been too crowded in the nursery; otherwise time is wasted before they start away into good growth. Moreover a few badly formed individuals may easily spoil the pleasing effect of a whole row. When the trees are in their places, the trunk should be clear of side branches for 8 ft. or more, and, of course, as the crowns begin to spread the lower branches must be further cleared to free the traffic of the roadway.

As regards the best time for planting, this may be done at any time when the leaves are off the trees, but from about the middle of October and on through November is the best season, as the soil is still warm. So long as the ground is not frozen or too wet, the work may be carried out up to March. The trees move best if they are transplanted with balls of earth; in this way less damage is done to the fibrous roots around the base of the trunk, and they commonly start into growth more quickly than if the soil is shaken out of them.

PREPARATION OF THE GROUND.

It is often advisable to replace part of the soil excavated from the street by stuff of better quality. This should always be done if the situation is specially unfavourable—e.g., on a bridge—but the extent to which it is requisite will vary so much, according to the nature of the original ground and the kind of tree to be planted, that it is impossible to lay down any definite rule. The matter is one which must be left to the planter. A skilful tree expert who understands his work will be the best judge in each particular instance how much good soil it may or may not be necessary to add. The general principles which govern the matter are easy to grasp. The tree must root rapidly, and start as soon as possible into vigorous growth, and for this a good rooting medium is needed. But as it is not intended that the tree shall become very large, a subsequent extensive development of roots is commonly undesirable, altogether apart from the trouble that might be caused by interference with gas mains, telephone conduits, &c. What really is required is that the root system shall get to work quickly at the start. All that is further wanted is that when once the tree has got hold of the ground there shall be a root system just sufficient to maintain it in good growth, and in a condition vigorous enough to enable it to stand the necessary shaping and cutting back. There must, of course, be no dying back of the branches due to root starvation, but, with the exercise of proper judgment at the time of planting, there ought to be no risk of the occurrence of this.

AREA OF EXPOSED SOIL ROUND THE BASE OF THE TREE.

When the tree is planted and staked, an open space ought always to be left around the base of the trunk, in order that the air may have free access to the soil. Roots require air to breathe, and deficient aëration is sometimes a cause of failure, particularly in relatively impervious soils. Plane trees are less sensitive in this respect than are most trees, and they will often flourish when there is only a square 2 ft. or 3 ft. of exposed soil round their stem. Possibly this hardiness is partly due to the way in which the trunks renovate their surfaces by means of the annual scaling of the bark. Most other trees are the better for an iron grating over the exposed soil area. This prevents the earth from being trodden hard, and water as well as nourishment can easily be given if necessary. For trees that are less hardy than the plane a grating should be given, and it ought not to be less than 3 ft. square for young trees, and if a larger one can be given so much the better. It is probably impossible, even were it desirable, to imitate the large gratings used in some cities—notably in Paris—but it should be always remembered that adequate aëration of the soil is one of the first requisites for success in growing trees.

SUBSEQUENT ATTENTION AND PRUNING.

After the trees have been planted they must not be left to themselves, but they should have the constant attention of a man who understands the work. Many of the attempts at tree planting have proved miserable failures because the individual trees have not been looked after, and the special requirements imposed by street conditions have not been sufficiently appreciated.

It is essential that, while the general effect of the trees as a whole in a street should be pleasing, and even imposing, they ought not to be allowed to rob the houses of an undue amount of light. On this ground alone it is evident that it is impracticable to permit any vigorous tree to grow to its "natural" size, and to develop (save in the case of pyramidal trees) its "natural" form unchecked. The size must be determined by considerations of space available in the street, while the form will also be similarly suggested by the height of the houses, width of the pavement, and, in general, by the amount of shading that is desired. Thus the form will come to be a more or less artificial one. In comparatively narrow pavements, and when the houses abut directly upon it, a pyramidal shape is probably the best on the whole. A tree of this form interferes least with the light that ought to reach the houses, and while the effect of a double row of well-placed and spaced trees, however formally they are trained, is not otherwise than decorative, it is secured without the sacrifice of hygienic considerations that ought to stand first. Of course, where the street and pavement are wide enough, a freer growth may justly be advocated. But however favourable to the tree a street may be, it will not be found possible to dispense with some measure of training and cutting. This should be taken in hand from the first, and then there would be an end to the hideous mutilated subjects that too often spoil the roads and avenues they ought to adorn. It ought never to be necessary to convert the trees into a row of telegraph poles, nor is it wise to defer training until extensive lopping provides the only remedy for past neglect. The pruning for shape as well as for size ought to be done annually, or at least at reasonably short periods that may vary in individual cases. Young trees certainly want looking after every year to clear out the useless twiggy growth that will inevitably tend to spoil the tree unless it is thinned

out. The older ones will be the better for frequent overhauling, as the effects of a light pruning are not so apparent and will not be so likely to arouse hostility as would be the case if delay renders more drastic treatment necessary.

A man who knows what he is about can easily secure any desired shape in the case of an amenable tree like the lime or plane. The latter is especially responsive to the knife, whether a formal pyramidal shape (like that of the very successfully trained trees in the Mall) or a more open character is wanted. But, however carefully pruning may be carried out, it will be necessary sooner or later to remove some of the larger branches. These should, if possible, always be cut right out to their base, and the wound, if smoothed and tarred, will soon heal over and become obliterated. If judiciously done, and with due regard for the filling of the gap, but little damage, if any, need be caused to the appearance of the tree.

Another advantage is secured by regular and systematic pruning, inasmuch as a balance is thereby established between the root and the upper part of the tree.

When a large crown is allowed to develop a correspondingly large root system is also formed. If such a tree be severely lopped, the large root system, it is true, will tend to bring about a vigorous recovery. But no such lopping ought to be needed, and on every other ground a moderate root system, such as can be automatically secured by continuously maintaining a moderately-sized top, is to be desired. . . .

Of course, whatever care be taken of the trees growing in streets, they cannot be expected to flourish as they would do under better and more natural conditions. The poisonous effects of minute quantities of ethylene gas, as well as of sulphur compounds, also militate against them. But the increased use of electricity and the concomitant diminution of the products of combustion of coal gas appear to be leading to a steady improvement of the atmospheric conditions in London, and perhaps a corresponding improvement in the health of the trees may be anticipated. At any rate, the time seems to have come when species other than the plane may be tried with some prospect of success. I venture therefore to suggest that, although the plane must continue to occupy the leading position to which its excellent qualities fully entitle it, at least some of the other species mentioned in this report should be tried, if on only a small scale.

SUMMARY OF THE FOREGOING REPORT.

The principal recommendations embodied in this report may be conveniently summarised as follows:—

(1) The trees most suitable for planting in the streets are:—

The Plane (*Platanus acerifolia* Willd.). Indifferent as to soil.

Tree of Heaven. (*Ailanthus glandulosa* Desf.). Indifferent as to soil if well drained.

Jersey Elm (*Ulmus nitida* var. *Wheatleyi*). Heavy soil, but tolerant.

Lombardy Poplar (*Populus nigra* var. *Italica*). Heavy soil; must not be too dry.

Others worth trying are:—

The Lime known as *Tilia euchlora* C. Koch. Tolerant, but should have good loam.

Sycamore (*Acer Pseudoplatanus* var. *purpurascens*). Heavy soil, with chalk or lime.

Balm of Gilead Poplar (*Populus Balsamifera* Candicans). Heavy soil.

Pink Hawthorn (*Crataegus plena*). Rather heavy soil, but tolerant of others.

(2) The trees should be planted, as far as possible, at equal distances from one another, their actual position being determined on a plan. A suitable distance would be 30 ft. to 40 ft., but narrow pyramidal trees might be a little closer together. Regard should be paid to the position and width of cross roads, entrances, and other obstacles, in order to realise the best effect in spacing as far as possible. Streets that run north and south are, other things being equal, better for planting than those running east and west. The trees in any one street or road should be of one species only, and as far as possible they should be kept even in size, and be shaped on a uniform scheme. The shape may be pyramidal or open, the latter being suitable for roads that are wide, and especially when the houses are separated from the pavement by forecourts.

(3) The trees may be planted at any time when the tree has shed its leaves, so long as the ground is not frozen or too wet. The latter half of October and the month of November is, however, the best time. The size of tree to plant depends on the species and on other circumstances, but a height of from 12 ft. to 16 ft. will be generally suitable. The trees are more likely to grow without a check if they are transplanted with a good ball of earth, as there will be a large number of uninjured small roots. The soil should be made firm during and at the completion of planting.

(4) Trees, when planted, commonly require the addition of good soil to start and maintain them in vigorous condition; but the urgency of this need will naturally vary with the locality, and also with the species of tree.

(5) It is essential that a certain area around the base of the trunk shall be freely exposed to the air in order that the roots may be able to breathe properly. Different trees vary in respect of this, the plane making, perhaps, the least demands. In the case of most trees a grating is desirable to prevent the soil being trodden hard, such gratings being from about 4 ft. square and upwards.

(6) The trees should receive frequent attention in order to secure and maintain an appropriate shape and size. Good results cannot be looked for unless this be done. Much of the unsightliness of a number of London trees is the natural result of inattention to this matter. Lopping ought seldom to be necessary, and by careful pruning a balance can be struck between the development of the crown and the root system.

(7) The improved condition of the London atmosphere within recent years renders the experiment of varying the kinds of trees to be planted a hopeful one. While it is recognised that the plane is certain to continue to be the most thriving tree, there is, perhaps, something to be said in favour of avoiding complete monotony by the introduction of other kinds of trees into the streets of the Royal Borough.

CORRESPONDENCE.

Ὃς ἄλλο μὲν πολλὰ ὁρᾷ

One man does not see everything.

Euripides.

RECENT CIRCUMSTANCES AFFECTING ROADS.

To the Editor of The Surveyor.

Sir,—I quite agree with Mr. Wood that some of the oil residuals are no better than tar—in fact, they have no advantage whatever over pitch or tar when prepared to the same degree of consistency, and there is no single quality possessed by an oil residual that is not contained in a prepared or tempered pitch, except, perhaps, the smell.

Native bitumen, on the other hand, derives its many advantages from the valuable mineral matter given it by Nature, and I can quite understand that the roads constructed by Mr. Wood in Fulham with natural bitumen have proved satisfactory.—Yours, &c.,

Citizen.

March 8, 1915.

Architects in the Forces.—The Royal Institute of British Architects has compiled a record of the members of the profession who have joined various branches of the Imperial Forces. The list now contains more than 1,200 names.

Glasgow's Reduced Street Lighting.—In Glasgow on Tuesday night a partial restriction of the street lighting was inaugurated, a step rendered necessary by the shortage of the coal supply. The scheme is that alternate gas lamps only are lit. The electric lighting is not affected.

Damages Against West Ham Corporation.—Damages amounting to £300 were awarded against the West Ham Corporation in an action in the King's Bench Division, brought by Herbert Spicer, a baker's assistant at Leyton, in respect of personal injuries he received last May. Plaintiff's case was that when he was driving a van along the Broadway, Stratford, a wheel of the vehicle was wrenched off owing to the defective condition of the tramway. Plaintiff was thrown to the road and his arm was broken, and its movement permanently impaired. The corporation denied plaintiff's allegations as to the accident and repudiated liability.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, 8t Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

460. Sewage Sea Outfall.—Are reinforced-concrete pipes better than cast-iron pipes for a sewage outlet into the sea which is covered at high water? Compare them as regards initial expense and maintenance. (J. R. H., *Ipswich.*)

463. Bomb-proof Dug-out. Give sketches of a bomb-proof dug-out to hold five people. (Theo.)

464. Masonry Arch. State three ways in which a masonry arch may fail, and describe the cause of each. (J. F., *Padiham.*)

465. Girder Design. What are the main points to be borne in mind when determining for a given purpose: (*a*) Type of girder; (*b*) proportions of girder (depth and width, &c.); (*c*) material to be employed (steel, wrought iron, or reinforced concrete)? (M. T. R., *Ebgl.*)

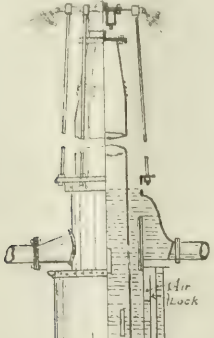
466. Road Making.—Describe a few simple tests that will enable an engineer to ascertain the quantity of the bitumen and filler to be used in a bituminous macadam road. (Enseer.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

459. Sewage Sprinkler.—Describe an efficient form of sewage sprinkler for percolating filters which requires very little head of sewage to work it. (J. R. H., *Ipswich.*)

A suitable sewage sprinkler which will work with a small head and at the same time give a variation in volume from five to six times is the "Adams." The advantage of this sprinkler is the fact that no gland or joint of any kind is used between the stationary column and the revolving body of the distributor. A simple airlock seal is used, which



is formed by the air left in between the annular chamber in the lower and stationary tank and the annular air space in the upper and revolving tank. The air is thus entrapped, and held under pressure due to the weight of water upon it, with the result that the water rises up to the height of the hydraulic head within the revolving body and over the distributor arms, and the distributor then revolves without friction. The mechanical wearing part is the ball race on the summit of the central column. Upon this ball race the whole weight of the distributor hangs and revolves. There are many other good patent sprinklers on the market, particulars of which can be obtained from the respective manufacturers. (Eneer.)

461. Applied Mathematics.—Give some simple examples of the application of the calculus to the solution of practical engineering problems. (Student.)

Find the magnitude of the resultant thrust on the end of a tank filled with water, the depth of the water being 10 ft. and the tank 16 ft. wide.

Considering an elemental strip of the submerged portion of area d at a depth x ft.

Weight of water = 62 lb.

Pressure at level of strip = 62 x lb. per sq. ft.

Area of strip = 16 dx sq. ft.

∴ Thrust on strip = $62x \times 16\,dx$

$= 1000\,x\,dx$

Total thrust $= \int_0^{10} 1000\,x\,dx$

$= 1000 \left[\frac{x^2}{2}\right]_0^{10}$

$= \frac{1000 \times 100}{2} = 50{,}000$ lb.

Find the point at which the resultant force in the preceding question acts—*i.e.*, the centre of pressure.

The centre of pressure will obviously be on the vertical line bisecting the rectangle, since the figure is symmetrical. Let the surface of the water be AB. To find the distance of the centre of pressure from AB, we have

Thrust on elemental strip $= 1000\,x\,dx$ lb.

Moment of this thrust about AB $= (1000\,x\,dx)\,x$ ft. lb.

Total moment about AB $= \int_0^{10} 1000\,x^2\,dx$

$= 1000 \left[\frac{x^3}{3}\right]_0^{10}$

$= \frac{1000 \times 10^3}{3}$ ft. lb.

Resultant thrust = 50,000 lb.

Let Y be the distance of centre of pressure below AB.

Then we have $50{,}000 \times Y = \frac{1000 \times 10^3}{3}$

$\therefore Y = \frac{1000 \times 10^3}{3 \times 50{,}000} = \frac{20}{3} = 6\frac{2}{3}$ ft.

below the surface.

(B. K., *Newport Mon.*)

[illegible] flywheel

[illegible] $= \pi r^2 dx \rho l$) $r^2 = 2\pi\rho l r^2\,dx$

Where ρ is mass per unit volume = for iron ·28 lb. per

Total inertia $= 2\pi\rho l \int_0^{R} r^2\,dx = 2\pi\rho l \left[\frac{R^4}{4} - 0\right]$

$= \frac{\pi}{2} R^4 l\rho = (\pi R^2 \rho l)\,\frac{R^2}{2} = \frac{M R^2}{2}$

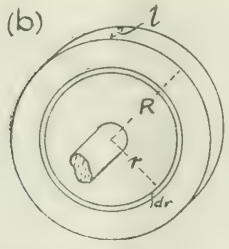
M being total mass of flywheel.

The energy of the flywheel can now be obtained, for it is easily shown that $K.E. = \frac{1}{2} I \omega^2$, ω being angular velocity in radians.

The radius of gyration (k) is defined by the equation

M $k^2 = I$ - *i.e.*, if the whole mass were concentrated at the radius of gyration, the inertia would be the same as before.

Then $M k^2 = \frac{M R^2}{2}$ or $k = \frac{R}{\sqrt{2}}$



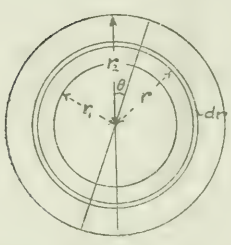
Strength of torsion shafts—

Let the shaft be twisted through an angle θ, and let the skin stress be f_2. Let f_1 be the stress at radius r

Then $f_2 \propto r_2 \theta$

$f_1 \propto r \theta$

$f_1 = \frac{f_2}{r_2} r$



Total force (often called "stress") on element

$= (2\pi r \cdot dr) \frac{f_2}{r_2} r = \frac{2\pi f_2}{r_2} r^2 dr$

Moment of resistance of element = force × radius

$= \frac{2\pi f_2}{r_2} r^3 dr$

Total strength of shaft $\frac{2\pi f_2}{r_2} \int_{r_1}^{r_2} r^3 dr = \frac{\pi f_2}{2 r_2} (r_2^4 - r_1^4)$

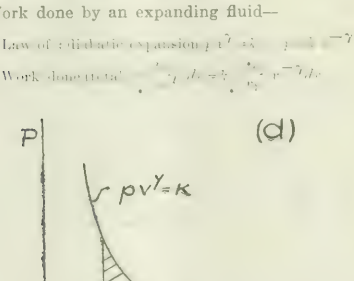
If the shaft is solid, total strength $= \frac{\pi f_2 r_2^3}{2}$

It follows that if, in place of a 4-in. solid steel shaft, we can substitute a hollow 4½-in. shaft of equal strength, its internal diameter will be 3·3 inches and the weight will be reduced from 41·6 lb. per foot run to 23·5 lb. This is an item to be considered, particularly in naval and marine engineering. Usually r_1 is about $\frac{3}{5} r_2$.

Work done by an expanding fluid—

Law of adiabatic expansion $p v^\gamma = k$ or $p = k v^{-\gamma}$

Work done total $\int_{v_1}^{v_2} p\,dv = k \int_{v_1}^{v_2} v^{-\gamma} dv$



$= k \left[\frac{v^{-\gamma+1}}{-\gamma+1} \right]_{v_1}^{v_2} = \frac{k}{\gamma - 1} \left[\frac{1}{v_1^{\gamma-1}} - \frac{1}{v_2^{\gamma-1}} \right]$

$= \frac{p_1 v_1}{\gamma - 1} \left[1 - \left(\frac{v_1}{v_2} \right)^{\gamma - 1} \right]$

An important formula in steam and gas engine calculations.

(F. W. P., *Loughborough*.)

Flow of water over triangular notch.—Angle 90°.

Consider layer AB of water of thickness dx at a depth x below surface

Let depth of water in notch be H

Width of strip (B C notch) = $2(H - x)$

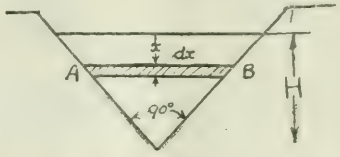
Area of strip = $2(H - x)\,dx$

Theoretical velocity of water under this head = $\sqrt{2gx}$

Quantity of water passing strip AB per sec. = area × velocity = $2(H - x)\sqrt{2gx}$

Total flow ng over notch

$2\sqrt{2g} \int_0^H (H - x) x^{\frac{1}{2}} dx = 2\sqrt{2g} \left[\int_0^H H x^{\frac{1}{2}} dx - \int_0^H x^{\frac{3}{2}} dx \right]$



$2\sqrt{2g} \left[\frac{2}{3} H x^{\frac{3}{2}} \right]_0^H - 2\sqrt{2g} \left[\frac{2}{5} x^{\frac{5}{2}} \right]_0^H$

$= 2\sqrt{2g} \cdot \frac{2}{3} H^{\frac{3}{2}} - 2\sqrt{2g} \cdot \frac{2}{5} H^{\frac{5}{2}} = 4\sqrt{2g} \cdot \frac{2}{15} H^{\frac{5}{2}} = kH^{\frac{5}{2}}$

This constant k is found by experiment to be 2·635

Quantity (cub. ft. per sec.) flowing over sharp-edged notch shaped like right-angled isosceles triangle = 2·635 $H^{\frac{5}{2}}$ (H in feet).

(W. R. H., *Waltham Cross*.)

EXPENDITURE ON LOCAL WORKS.

A GOVERNMENT CIRCULAR.

In the House of Commons on Wednesday Mr. Herbert Samuel, President of the Local Government Board, stated, in reply to questions, that he was about to issue to local authorities a circular emphasising the desirability of restricting local works in view of the need of economising both labour and capital.

A New Urban District.—Official notice has been received confirming the order of the West Riding County Council constituting Adwick-le-Street, Skellow and parts of Owston and Brodsworth a new urban district. Included in the area are Brodsworth and Bullcroft collieries, and the Woodlands model village.

Elephants for Road Making.—The German military authorities are reported to have mobilised the elephants from Hagenbeck's menagerie. They have been sent to Valenciennes with their keepers, where they will be employed to help in road making and for other work where great drawing power is required.

Water Supply in Siam.—A British consular report issued yesterday states that a sum of £5,000 was allotted to the Bangkok waterworks for the year 1913-14, and that the works are expected to be completed and in operation by April 1. The laying of the pipes has already been completed, and fountains and hydrants have been established along the principal roads.

Value of Sewage Sludge.—Dr. J. Grossmann, M.A., on Friday last, at a meeting of the Manchester Section of the Society of Chemical Industry, read a paper on "Concentration of Sewage Sludge." Dr. Grossmann pointed out that the cheap and effective manner in which the sludge could be obtained in a concentrated form should be of special interest to Manchester and Salford, where the sludge was carried by means of a steamer to the sea and dumped there. Sewage sludge represented an intrinsic value of at least £2,000,000 per annum, and it should be recognised that it was a national asset which should be dealt with by the Government in the interests of agriculture, to which a cheap and efficient manure will be of incalculable benefit.

The Surveyor
And Municipal and County Engineer.

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SOME RECENT PUBLICATIONS.*

Lockwood's Builders' and Contractors' Price-book, 1915. Edited by Francis T. W. Miller. Price 8s. London: Crosby, Lockwood & Son.

The new edition of "Lockwood" is issued to bring upon the old plan, and those who are accustomed to use this excellent price-book will find it every whit as useful as in past years. The principal additions to the volume are the result of the Labour Unrest, and the consequent difficulty in forecasting prices in the future, particularly in regard to wood goods. The list of prices is very complete, and the memoranda in the appendix refer to most matters which the builder or contractor is likely to know in daily practice. The London Building Acts, 1894 to 1909, and various enactments and regulations relating to buildings in the Metropolis are contained in a supplement. Lockwood's price-book has made many friends in the past, and may be recommended as a thoroughly comprehensive and reliable work for builders, contractors and others concerned in estimating and pricing.

Laxton's Price-book, 1915. Price 4s. London: Kelly's Directories, Limited.

It will come as a surprise to many to learn that this well-known standard work is approaching its centenary, the present being the ninety-eighth annual issue. The volume, which retains its familiar form, will be found to contain some 73,000 prices, in addition to valuable appendices of by-laws, statutes, and decisions of the courts affecting the building trade. The work needs no recommendation, as it has long been considered as an indispensable adjunct to every builder's office. Suffice it to say that the present issue well maintains the traditional standard. It is pointed out in the preface that the present shortage of certain materials derived from abroad, and the high prices demanded for such articles (especially timber and zinc), make it difficult to amend the old prices with any accuracy so as to apply to the future. Those who use the book must, of course, watch the market, and in the abnormal circumstances make their own adjustments.

Machine-shop Practice. By W. J. Kaup. Price 5s. 6d. nett. London: Chapman & Hall, Limited.

This volume forms one of the Wiley Technical Series, and is intended as a manual for apprentices and journeymen machinists, and for use in trade, industrial and technical schools. It is desirable that such a work should be concise and yet something more than and different from a mere collection of formulæ and rule-of-thumb methods. In this direction the author has well succeeded in his task, inasmuch as [illegible] of shop [illegible] invariably accompanied by the reasons which have led to their adoption. Interspersed throughout the book are several series of practical questions to enable the student to assure himself that he has mastered the preceding work. The necessity for system is emphasised in a very useful appendix.

Mechanism of Steam Engines. By W. H. Dooge and M. W. Dole. Price 8s. 6d. nett. London: Chapman & Hall, Limited.

This work, which is published in New York by Messrs Wiley & Sons, is appropriately and accurately named, inasmuch as it makes no attempt to deal with the underlying heat theory or the details of construction, but is confined to the kinematics of reciprocating steam engines and steam turbines. The subject is treated clearly, concisely, and in logical order, commencing with a general discussion of a reciprocating steam engine and proceeding by stages to a consideration of steam turbines and their valve mechanisms and governors. The book should prove very useful to students who are familiar with the elements of mechanism, but who have not yet studied the theory and practice of heat engineering or machine design.

Materials by Machines. By A. W. Smith. Price 5s. 6d. nett. London: Chapman & Hall, Limited.

This book is intended to give the reader an elementary account of the several metallic materials used in the construction and operation of machines. The first part of the work deals with the manufacture of materials, and contains, among other matters, a good, though brief, account of the metallurgy of iron, steel, copper, lead, tin, zinc and aluminium. The second part is concerned with the properties of materials, the final chapter being devoted to the selection of materials for machines. The author has succeeded in stating clearly a group of correlated facts in a single very useful volume.

The Sanitary Record and Municipal Engineering Year-book. Price 5s. nett. London: The Sanitary Publishing Company, Limited.

This is the thirty-third annual issue of this publication, and it has not only been thoroughly revised, but also considerably enlarged. The directory of municipal authorities and their officials is very complete, while the scientific and technical data and the lists of municipal engineering, public health and scientific institutions and societies have been carefully brought up to date. We cordially commend this work as a useful desk companion for all connected with municipal engineering, public health and sanitary work.

Willing's Press Guide, 1915. Price 1s. London: James Willing, Limited.

Following the precedent of former years, the forty-second annual issue of this well-known publication has been carefully revised, and its reputation is well maintained as a handy work of reference in regard to all Press matters. The information appears to be remarkably complete, and is well arranged. The work is useful alike to the professional journalist and the freelance.

Building Construction Drawing. Part II. By Richard B. Eaton. Price 1s. 6d. nett. London: E. & F. N. Spon, Limited.

Part II. of Mr. Eaton's work consists of a series of twenty-six well-drawn plates together with descriptive specifications. The drawings are practical and instructive, and are thoroughly suited to the requirements of the elementary student, and the artizan for whom they are more particularly intended.

Russian [illegible] Tables

In view of the increasing importance of trade with Russia, the issue of information regarding the somewhat complicated Russian weights and measures, and especially of equivalent tables, permitting of instant conversion of British weights, measures and money into Russian and *vice versâ*, is of considerable interest to the trading community, and many of our readers will doubtless be glad to know that the Central Translations Institute, Limited, 265 Strand, W.C., have compiled from official figures a set of tables covering all ordinary commercial requirements, and have published these at the price of 1s. nett.

Bituminous Materials for Road Construction. The concluding instalment of the matter which appeared under this heading in last week's issue is unavoidably held over.

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Carlisle R.D.C. (March 2nd. Mr. R. G. Hethering ton). £59,250 for a water supply scheme from Roughton Gill, in the Caldbeck Fell. It was stated by Mr. G. A. Lethbridge, on behalf of the council, that the district was in urgent need, only about half of the population being at present supplied with water. The negotiations with the Carlisle Corporation, who were willing to provide water in bulk for their supply, he pointed out, had come to nothing, entirely on the ground of cost. Dealing with the source of the supply, he said it was a disused mine in Caldbeck Fells, and, subject to the approval of the Local Government Board, a contract for the acquisition of the water had been entered into with Lord Lecconfield, who had agreed to accept £1,500 for his water rights.

Goole U.D.C. (March 4th. Mr. H. R. Hooper). £13,000 for the erection of new plant at the gas-works.

The inspector said the Treasury were not prepared to sanction loans for local purposes or for any works which were not absolutely necessary. There seemed no immediate need to spend this money. The consumption of gas was decreasing, and the council should try to get through the war without incurring this expenditure. The gas manager said they would be running a risk. The inspector: Quite so; we are all running risks. I cannot conscientiously advise the board to sanction the loan.

Hartlepool T.C. (March 3rd. Mr. H. S. Stewart). —£15,000 for the erection of working-class dwellings. —In the carrying out of the scheme ninety-one working-class families will be displaced, for the present property is all to be demolished. The districts will then be laid out afresh, new and wider streets being made, and new houses erected. For the present it is intended only to build thirty-four new houses at a cost of from £210 to £250 apiece, leaving the remainder of the land vacant for future development.

Leyland U.D.C. (February 24th. Mr. F. H. Tulloch).—£1,283 for works of water supply.—The proposed works consist of an auxiliary water main to ensure for the higher reaches of the district an adequate water supply. They will also include the execution of works in the township of Clayton-le-Woods. The surveyor, Mr. M. H. Wilkinson, said the proposed scheme had been brought about through complaints by water consumers in the higher districts that on Mondays, and occasionally on other days, when Thirlmere water was being used, especially in very fine weather, the water supply would fail altogether for a few hours. It was considered that the proposed main—a 6-in. one—would provide a complete circulation of water at all times.

Meriden R.D.C. (March 4th. Mr. William Cross). £3,700 for the proposed Fillongley sewage disposal scheme.—It was stated that the county medical officer, Dr. Bostock Hill, in his reports had mentioned several times the necessity of a sewage scheme being provided for Fillongley, and pressure had been brought to bear on the Meriden Council by Birmingham. The estimated cost of the original scheme was £1,700, but it was now proposed to provide the outfall at a greater distance from the village, and the cost of the new scheme was estimated at £4,400.

Newcastle-upon-Tyne T.C. (March 3rd. Mr. M. K. Northe. £29,700 for the provision of baths in three suburbs.—The inspector directed attention to the Treasury recommendation that borrowings by public bodies should be restricted to absolutely necessary schemes during war time, and asked for information to prove that the provision of baths was urgent and necessary, as unless that was forthcoming the board would not sanction the loan. The town clerk, Mr. A. M. Oliver, stated that the scheme was decided upon before the war, and if it was not proceeded with the corporation would have to pay £860 out of revenue for architect's and other fees. It was also anticipated that shortly, owing to War Office contracts being completed, there would be considerable unemployment in the building trade. The scheme had been hurried forward in view of the Local Government Board's request that contracts should be accelerated to provide for unemployment.

Southport T.C. (March 4th. Major J. Stewart).—£9,000 for the development of the lagoon site.—The town clerk, Mr. J. E. Jarratt, said that the council last summer had before them a much greater scheme, but after the outbreak of war they thought it would not be desirable to proceed with it. The cost of the whole scheme would be £30,000 or £35,000. The £9,000 dealt only with one-third of the area they proposed ultimately to put under development. The corporation intended to spend this Spring about £750 to £1,000.

APPLICATIONS FOR LOANS.

Banbury R.D.C. £1,656 for a sewage disposal scheme for Great Bourton, and £919 for a sewage disposal scheme for Little Bourton.

Brampton R.D.C.—£200, supplemental loan for the Castlecarrock sewerage scheme.

Brigg R.D.C.—£4,824 for the erection of houses at Coxhill and Killingholme.

Conway T.C.—£1,275 for the provision of a cemetery.

Darlington T.C.—£13,000 for the electricity undertaking.

Dover T.C.—£6,000 for electrical plant.

Dublin T.C.—£56,030 for the provision of working-class houses.

Folkestone T.C.—£2,040 for the repair of Foord-road.

Hebburn U.D.C.—£470 for hospital extension, £500 for sewerage works, £189 for a street bridge, and £1,855 for school extension.

Melton Mowbray U.D.C.—£4,824 for the erection of twenty-four houses.

Nuneaton T.C.—£1,750 for electricity cables extensions.

Ramsgate T.C.—£116 for street improvements.

Stockton T.C.—£3,261 for water main extension.

Taunton T.C.—£1,175 for the electricity undertaking, and £550 for mains.

Wakefield T.C.—£1,530 for the purchase of land for school purposes, and £250 for road widening.

LOANS SANCTIONED.

Barrow-in-Furness T.C.—£42,537 for the purposes of the gasworks.

Batley T.C.—£6,500 for electrical cable extension.

Chipping Norton T.C.—£1,657, supplemental loan for sewerage and sewage disposal works.

Manchester T.C.—£20,000 for the purposes of the electricity undertaking.

Monmouth C.C. £11,985 for the Newbridge higher elementary school.

Nelson T.C.—£6,344 for private street works.

Neyland U.D.C.—£200 for gas services.

Seaford U.D.C.—£630 for the erection of two workmen's cottages.

Shipley U.D.C.—£12,748 for new municipal offices.

Sunbury U.D.C.—£1,844 for resurfacing Staines-road with Tarmac.

Tunbridge Wells T.C.—£4,155 for sewerage works.

Westhoughton U.D.C.—£1,440 for a refuse pulveriser (£740 for thirty years and £700 for fifteen years).

West Riding C.C. £3,552 for a new school at Wetherby.

Wolverhampton T.C.—£1,600 for a gymnasium at the girls' high school.

FORTHCOMING INQUIRIES.

MARCH.	£
16.—**Bolton-upon-Dearne.** For the purposes of a refuse tip (Mr. Edgar Dudley)	625
16.—**Cleethorpes.** For the purposes of road widening (Mr. Edgar Dudley)	6,250
16.—**Luton.** For hospital extension (Dr. A. S. McNalty)	5,320
16.—**Tunbridge Wells.** For the purposes of the electricity undertaking (Mr. H. R. Hooper)	7,520
17.—**Grays Thurrock.** For electricity purposes (Mr. H. R. Hooper)	600
17.—**Rothwell.** For works of water supply (Mr. W. M. Cross)	2,250

		£
18.	**Waterloo.** For street widening and improvement (Mr. Edgar Dudley)	7,912
19.	**Bilton.** For work of sewage disposal (Mr. W. M. Croy)	3,300
14.	**Derby.** For the purposes of street improvement (Mr. Edgar Dudley)	1,300
19.	**Leyton.** For road widening and the provision of a public convenience (Mr. M. K. North)	2,110

TOWN PLANNING.

25. **Birmingham.** (Mr. Raymond Unwin)

SEWAGE DISPOSAL AT GUILDFORD.

BOROUGH SURVEYOR'S REPORT.

A report prepared by the borough surveyor of Guildford, Mr. E. Young Harrison, on the treatment of the sewage from that borough has been adopted by the town council, and the borough surveyor has been authorised to have made from time to time analyses of the tank and other effluents.

The dry weather flow at present the report says, is estimated at 1,240,000 gallons per day from the high-level sewer, 420,000 from the low-level, and 160,000 delivered by the Woodland Land. The present system includes both tank and land filtration, but the former is to be now abandoned. The area of the farm is 243·50 acres, of which 94·8 acres are devoted to allotments, tanks, filter-beds, buildings, roads, &c., and 18·26 acres are reserved for sewage purposes.

Taking the latter at 20,000 gallons per acre per day, some 27 to 30 acres would be required to deal with the Guildford daily flow. Assuming they of the average were of average strength. As however it may be classed as a strong one, that amount would be a safer figure. If therefore the whole of the 120 acres that are suitable and available for irrigation purposes were entirely devoted to the purification of the tank effluent it would be possible to allow only the land at a time, and then the remaining half could be brought in use to give the first portion the necessary rest. With these figures before me, and the knowledge that until the present time a definite effort has not been made to bring into service for sewage irrigation only the whole of this available land, it appears to me that a fair trial should be made on these lines before the council consider further the question of extending their antiquated works. I would recommend—

(1) That the land be split up into suitable area-metred plots, varying in size from 3 to 6 acres, allocated as follows: Initially flow 240,000 gals., 3·96 ac. 240,000 gals., 6·94 ac. 160,000, area 2·34.

(2) That these plots be ploughed, carefully levelled and rolled.

(3) That the plots be arranged as far as the under drainage supply carriers and fall of the land will allow, so that they may be under definite separate control, effluent carriers and chambers, with penstocks, to be provided where not already existing, so that samples can be taken, and, if found desirable and possible, the sewage may be held in contact with the soil for some hours.

(4) The largest part of the land to be left uncropped though certain plots might with considerable advantage be cropped with mangolds, rabi and rye grass.

It has been impossible, owing to the flooded nature of the land, due to the exceptional rainfall, to take the necessary levels in order that a detailed estimate should accompany this report. A large amount of the work of levelling, however, could be done without increasing the farm staff above the average of the past year. The expenditure upon penstocks, bricks and pipe carriers for the chambers should not cost more than about £80. I suggest that the means of distribution should be chiefly by means of earth carriers in embankment, until we are able to judge as to the results possible.

The management of the farm, to be effective, must be under one head, who should be directly responsible to the borough engineer. The farm has doubtless suffered much through mismanagement in the past. To what extent the present staff is responsible for this it is difficult for me to say. I do not, however, at present feel justified in recommending that a change is immediate, and I would therefore suggest that for a period of six months the superintendent of the sewage destructor works be placed in charge of the whole of the farm and sewage disposal staff under my direction, and that he devote his attention chiefly to obtaining the discharge of the sanitary authority.

Alderman Patrick, chairman of the Drainage Committee, said the report of the surveyor was a very valuable one. It really amended the position between the council and the ratepayers previously, as they knew that they should do less farming, and use the land more for the treatment of sewage. It was estimated that the expenditure suggested would amount to about £50, but if by that means they could treat more sewage on the land without going in for larger expenditure on tanks and filter-beds, he was sure the ratepayers would agree that the money would be well spent.

Mr. J. B. Eggar asked whether the Committee had seen a model.

Alderman Patrick said the tank was working fairly satisfactorily.

A STREET ACCIDENT.

ACTION AGAINST COUNCIL AND CONTRACTORS.

At the Brentwood County Court on Friday last, His Honour Judge Lush, K.C., sitting with Mr. Tom Blundell Brown, of Dytchleys, South Weald, Brentwood, brought an action against the Brentwood Urban District Council and Messrs. S. Cronin & Sons, the latter to recover £10 damages for the loss of a pony which had to be killed following injuries from a fall for which, it was alleged, the defendants were responsible by reason of their negligence in leaving an excavation in the county highway unprotected.

Mr. A. R. Macklin was counsel for plaintiff, Mr. J. Gamble, solicitor, represented the Brentwood Urban District Council, and Mr. C. E. Jones, counsel, was for Messrs. S. Cronin & Sons, contractors.

The defendants, Messrs. Cronin & Sons, on June 27, 1914, were constructing a public convenience in the High Street, Brentwood, under a contract with the Brentwood Urban District Council. The excavation had been enclosed by a hoarding with a gate at each end. Plaintiff's groom left the pony standing while he went into a shop, and immediately his back was turned it ran away, and dashed into the open gate at one end of the hoarding. The cart caught the posts, but the harness broke, and the pony fell into the hole. It had subsequently to be killed.

Plaintiffs contended that the gates should have been closed, or that a man should have been stationed at the gateway.

Mr. Jones submitted that all reasonable precautions had been taken by the defendants. When a pony ran away it ran blindly, and was likely to collide with any obstacle.

The cases cited by Mr. Macklin in support of the contention that the council would be liable for the negligence of the contractors, although they had no control over the contractors' men, were *Harrold and Another* v. *Watney*, Law Reports, Queen's Bench Division, 1898, p. 320), and *Penny* v. *Wimbledon Urban District Council* (reported in the same volume, p. 213).

His Honour found that there was no negligence on the part of defendants, and gave judgment in their favour.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier.*

Housing in Ireland.—In answer to questions in the House of Commons on Monday, Mr. Acland said the question as to whether any further loans from the Local Loans Fund could be made to local authorities in Ireland during the current year for housing purposes, depended on the demands made on the fund during the next few months, on account of loans already sanctioned.

Kent County Council Workmen's Wages.—The Kent County Council have granted an increase in wages from 1s. to 3s. per week to about 800 of their workmen. The total increase will amount to nearly £4,000 per annum. Mr. A. C. Norman, the chairman of the Bridges and Roads Committee, and Mr. H. T. Chapman, the county surveyor, are stated to have considered each case individually. The allowances in respect of lodging money have also been increased and other concessions made to men working long distances from their homes.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works on which particulars appear below: Buildings—Doncaster, Newport; housing and town planning—Carlisle, Middleton; roads and materials—Ivor, Lewisham; sewerage and sewage disposal—Spalding, Stafford; water, gas and electricity—Highworth, Macclesfield.—Particulars of other projected works will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Alnwick T.C.—Plans have been approved for the erection of a public convenience in Market-place.

Bournemouth T.C.—Two groynes are to be constructed on the beach for the protection of the Undercliff-drive.

Dewsbury T.C.—Plans have been approved for the extension of the borough surveyor's and education departments at the town hall, at an estimated cost of £1,300.

Doncaster T.C.—Provisional plans for new municipal offices have been agreed to. The estimated cost is £30,000, property acquired £5,200, erection of new premises £20,000, equipment £4,800. A recommendation has been adopted to expend £5,300 in additional tramcars, £1,850 in the enlargement of tramcar sheds, £700 in covering the Cheswold, and £500 for other subsidiary works in connection with the tramways. It was also agreed to incur provisional expenditure of £18,000 for an isolation hospital.

Leyton U.D.C.—A scheme has been approved for the erection of a public convenience at the corner of Church-road and Lea Bridge-road.

Neath T.C.—The extension of the Gnoll school, erected at a cost of £10,000, was formally opened recently. The borough engineer, Mr. D. M. Jenkins, prepared the designs, and the work was carried out by Messrs. D. Davies & Son, Cardiff.

Newport (Mon.) T.C.—The latest phase of the much-discussed bridge question was reached on Tuesday, when the council decided to obtain the advice of Mr. Basil Mott, M.Inst.C.E., for which it was agreed to pay a fee of 200 guineas and out-of-pocket expenses.

Paddington B.C.—An estimate of £3,000 has been approved for the adaptation of Woodfield-road wharf as a depot for the storage of materials, according to a plan prepared by the borough surveyor, Mr. E. B. B. Newton.

Shoebury U.D.C.—It was reported that the Joint Hospital Committee had decided to carry out necessary extensions at the Sutton Ford isolation hospital, at an estimated cost of £2,000.

Sleaford R.D.C.—The Local Government Board have refused to grant a loan to the council for the purchase of new offices. At a meeting of the council on Monday it was decided to raise the money out of the rates if necessary.

Sowerby Bridge U.D.C.—Plans have been approved for alterations to the public swimming baths.

HOUSING AND TOWN PLANNING.

Bangor T.C.—It has been resolved to purchase eight houses in Kyffin-square, with a view to erecting workmen's dwellings on the site, and it is hoped to buy other houses in the square for the same purpose.

Bath T.C.—The Baths Committee, in conference with the Surveying Committee, have decided to promote a town planning scheme.

Carlisle T.C.—The council on Tuesday confirmed the proposal of the Health Committee for the erection of thirty-six houses for the working classes, at an estimated cost of £5,582.

Coventry T.C.—Subject to a loan for the work being sanctioned, the council have accepted the tender of Mr. E. Harris, Coventry, at £17,591, for the erection of twenty-one workmen's cottages and seventy-six workmen's flats at Goring-road, Clay-lane, and Stepney-road.

Middleton T.C.—It is proposed to build twenty-four houses on the Boarshaw estate, at an estimated cost of £5,000.

Whitley and Monkseaton U.D.C.—Application has been made to the Local Government Board for sanction to prepare a town planning scheme.

REFUSE COLLECTION AND DISPOSAL.

Westhoughton U.D.C.—The Streets Committee have been authorised to obtain the lease of a site for the installation of a refuse pulveriser.

ROADS AND MATERIALS.

Antrim C.C.—The county surveyor, Mr. David Megaw, reports that in five county districts there are formal proposals intended to make provision for possible unemployment in the neighbourhood of industrial areas, and in three of these the Road Board have given definite promises to assist in case it may be necessary to undertake the works.

Bedwellty U.D.C.—Estimates have been submitted for widening Upper-road, Cwmsyfiog, at an estimated cost of £1,150, and negotiations are to be opened up with the county council and the landowners concerned with a view to obtaining financial support for the scheme.

Cirencester U.D.C.—It has been agreed to expend £1,150 upon the purchase of property at the corner of Cricklade-street for street improvement purposes.

Cork T.C.—The Road Board have sanctioned a grant of £1,000 towards the cost of improving Western-road and Lower Glenmore-road.

Dublin T.C.—The estimates of the Cleansing Committee have been increased by £2,800 for the wages of additional men to be employed in cleansing the streets.

East Molesey U.D.C.—Tenders for ordinary tar at 2½d. per gallon, and refined tar at 3¾d. per gallon, have been accepted from the Kingston Gas Company and Messrs. E. Catchpole & Sons respectively.

East Westmorland R.D.C.—The surveyor, Mr. J. Kilner, reported that he proposed to devote a large portion of the coming summer to the repair of high-lying roads about Little Asby, Whygill Head, and Griseburn. Most of those roads required a lot of metal, as they were too soft to allow of making a passable job in the ordinary way; so he would put in a strong foundation. He would in the meantime get as much stone broken and quarried as he could.

Fareham R.D.C.—A scheme has been adopted for the improvement of the Portsdown Ridge-road, at an estimated cost of £7,000.

Finsbury B.C.—It has been agreed to carry out paving works in Northampton-square.

Gelligaer U.D.C.—An intimation has been received that the Road Board have sanctioned a grant of £3,400 towards the construction of the proposed new road from Pengam to Ystrad Mynach.

Halifax T.C.—The borough engineer, Mr. J. Lord, has received instructions to prepare plans for private street improvement works, and to serve notices on the owners requiring them to carry out the works.

Hereford T.C.—The council have forwarded to the county council plans and estimate (£483) for the improvement of Whitecross-road.

Huthwaite U.D.C.—The tenders of Messrs. James Oakes & Co., for slag, at 4s. 8d. per ton, and the Butterley Company for chippings, at 4s. 9d. per ton, have been accepted.

Kent C.C.—Under the Development and Roads Improvement Act, 1909, it has been decided to make application to the Road Board for a contribution of £49,600 for bituminous carpeting and pitch grouting, for surface improvement. Eight schemes of main road improvement have been forwarded to the board for contributions. The most important of these schemes, by reason of its connection with military stations, is the widening, improving and rounding off of five dangerous corners on the Isle of Grain road near Lower Stoke, for which the land has been given by the owners free of cost, and which it is estimated will require £924 to complete. In this instance the committee have asked the Road Board to contribute the whole cost.—It was reported by the Bridges and Roads Committee that normal work on

the main roads had been impeded by the scarcity of labour, owing to the permanent residents having entered the industrial activities for housing and the military requirements in the district, and at the cost of the War Office through the Road Board of roads used for military traffic. The county surveyor, Mr. H. T. Chapman, with the approval of the committee, was undertaking all such work for the assistance of the military authorities.

Kildare C.C.—The council are applying to the Road Board for a grant of £1,625 and a loan of £1,625 free of interest, for the purpose of steam rolling the Dublin-Limerick road between Naas urban boundary and Leixy bridge at Naas.

Lewisham B.C.—The Finance Committee are giving consideration to a report by the borough engineer, Mr. E. van Praagen, on the question of road construction to be carried out during the ensuing financial year. Mr. van Praagen suggested that certain parts of Brownhill-road, Catford-hill, and Sangley-road and Sandhurst-road should be concreted to a depth of 13 in. below the finished level of the surface and 9 in. of cement concrete laid in trams and when would admit of their being paved with wood at some future time. Money could be borrowed from the county council for the concrete and excavation work over a period of ten years. Torridon-road, Springbank-road, Eltham-road, and portions of Burnt Ash-hill should be concreted. The committee had approved of the following work being undertaken subject to the Finance Committee submitting an estimate and to a loan being obtained as suggested: Brownhill-road, from Rushey Green to Ladbroke-road and from Mirabel-road to No. 337 (including loan charges), £1,143 15s.; Catford-hill, from the corner of Stanstead road to Exbury-road (including loan charges), £866 5s.; Sangley-road and Sandhurst-road up to Muirkirk-road (including loan charges), £1,906 16s.; Torridon and Springbank roads, £945 0s.; Burnt Ash-hill, £1,092 18s.; Eltham-road £208 10s.; total, £6,262.

Sunbury U.D.C.—Carting tenders for the year ending March 31st next have been accepted from Mr. J. H. Scott, for piece work at 1s. 3d. per cubic yard, day work 8s. per day, horse and man to provide cart or water van 8s., unloading 8d. per cubic yard, and for scavenging £135. For granite the tender of the Enderby and Stoney Stanton Granite Company, Limited, Narborough, has been accepted.

Swansea T.C.—A scheme is under consideration for the construction of a new road from Penvilla-road to Bryn-street, Brynhyfryd.

Swindon T.C.—A scheme has been prepared for widening Shaftesbury-road and application has been made to the county council and the Road Board for a contribution towards the cost, estimated at £2,800.

Westhoughton U.D.C.—The council have agreed to take up a loan for the reconstruction of New Brook-road with granite setts, the county council repaying 90 per cent of the interest and repayment, and the surveyor, Mr. George Hayes, has been instructed to prepare plans, sections, and estimates.

Winchester T.C.—Wood block paving is to be laid down at St. Cross, at an estimated cost of £2,000.

Worksop U.D.C.—The surveyor, Mr. G. Rawson, has received instructions to prepare a plan of a proposed improvement in Crown-street.

SEWERAGE AND SEWAGE DISPOSAL.

Banbury R.D.C.—The council have approved schemes for sewerage and sewage disposal works at Great Bourton and Little Bourton, estimated to cost £1,656 and £919 respectively.

Donaghadee U.D.C.—The surveyor has received instructions to report upon the advisability of installing gullies in the streets for the prevention of flooding.

Doncaster R.D.C.—The tender of Messrs. Jonas Rogers & Son, Conisborough, at £4,513, has been accepted for additions to the Conisborough sewage disposal works.

Folkestone T.C.—A scheme has been adopted for the treatment of the sewage from the western outfall at an estimated cost of £1,000.

Lymington R.D.C.—Application is to be made to the War Office for a contribution of £2,000 for the provision of larger purification tanks at Milton, in connection with the scheme for a military hospital.

St. Columb R.D.C.—An intimation has been received from the Local Government Board that they would not be prepared to grant the council's application to borrow £600 for the [illegible] whole village was considered.

Seaford U.D.C.—With reference to the application from the War Office for the [illegible] camp at Seaford, the council resolved that the War Office be informed that the council were prepared to carry out the scheme if the following arrangements were satisfactory to them—viz.: The War Office to contribute £650, and the council to undertake to complete the work within six weeks after the contract was signed, subject to the Local Government Board sanctioning the loan.

Spalding U.D.C.—Revised plans have been approved [illegible] which is £8,000.

Stafford T.C.—The council have adopted the scheme [illegible] borough engineer, Mr. W. Plant.

Worcester T.C.—In order to obtain a test of the engineer's proposal for washing the gravel in the filters at the sewage works, the Water Committee have been authorised to purchase one washing apparatus, with elevator, and to carry out alterations in the pipes of the filters, at an estimated cost of £200.

Wortley R.D.C.—A scheme has been adopted for the improvement of the sewage disposal works at Tankerley, at an estimated cost of £1,020.

WATER, GAS, AND ELECTRICITY.

Aberdeenshire C.C.—The Deeside Committee have [illegible] water pipes in the Aboyne district.

Exeter T.C.—With reference to the application to borrow £10,000 for the carrying out of the Truro Electric Light Order, the Local Government Board have written that the time does not seem very opportune for raising a loan for installing a new electric light undertaking, and asking to be furnished with the council's observations on the point.

Halifax T.C.—The proposal to accept a tender of £33,276 for the erection of carbonising plant at the gasworks was withdrawn at the council meeting held recently.

Highworth R.D.C.—It has been resolved to provide a water supply for Wroughton, including the construction of a reservoir with a capacity of 250,000 gallons.

London C.C.—At the present time the total safe working over load capacity of the plant at the Greenwich generating station, excluding a reciprocating engine which will shortly be dismantled, is 39,000 k.w. To this should be added 3,500 k.w. additional supply about to be obtained from the London Electric Supply Corporation, raising the total capacity to 42,500 k.w. The present load on the station plant is 32,000 k.w., so that the capacity of the spare plant will amount to 10,500 k.w. The Highways Committee are of opinion, however, that in order that more spare plant may be available and additional cars run, a further reserve supply of power of about 4,000 k.w. should be obtained from an outside source. The capital cost of making the connections to enable this additional supply to be provided is estimated at £11,800.

Macclesfield T.C.—A scheme for the improvement of the water supply [illegible] at an estimated cost of £2,000.

Oswestry R.D.C.—A water supply scheme is to be carried out at an estimated cost of £600.

Southampton T.C.—The tender of Messrs. A. C. Potter & Co., London, at £875, has been accepted for new pumping plant for the waterworks.

Stockton T.C.—It is proposed to remodel the carburetted water-gas plant, at an estimated cost of £1,290.

Wigton R.D.C.—The council have adopted the plan prepared by the surveyor, Mr. T. B. Simpson, for the extension of the Westnewton water supply to Howrigg and Crossrigg, at an estimated cost of £320.

MISCELLANEOUS.

Merton U.D.C.—The workmen in the surveyor's department have been granted 1s. a week [illegible] in some cases and in others 2s.

Oldham T.C.—It was stated at the Parks and Cemeteries Committee that a number of trees in the

public streets had died, and a member said this was owing, in some cases, to the trunks having been cut by the guard. The chairman remarked that the guards were an obstruction, and if they killed the trees they were no use. The committee decided to send the matter to the Surveyor's Committee to deal with.

Teddington U.D.C.—The wages of the workmen have been increased by 10 per cent for those receiving less than, and 5 per cent for those receiving over, 30s. per week.

Tiverton R.D.C.—The Devon County Council have written with reference to the utilisation of waste lands, stating that they had been requested by the Board of Agriculture to ascertain particulars of waste lands which might reasonably be expected to repay development. Mr. H. G. New said there was a good deal of waste land at Uffculme, but he did not think the parishioners there would care to have it touched. It was decided to refer the letter to the various parochial committees in the district with a request for particulars on the subject.

PERSONAL.

Mr. T. Hague, surveyor to the Ulverston Urban District Council, has had his salary increased by £25 a year.

Mr. F. Simmonds, junr., of Littlestone, has been appointed surveyor and inspector to the New Romney Town Council.

Mr. P. N. Ginham, an assistant architect under the London County Council, will retire on superannuation at the end of the month.

Mr. G. F. Whitelock, of Scunthorpe, Lincolnshire, has been appointed assistant surveyor to the Langport Rural District Council.

Mr. Edward Sykes, late surveyor to the Cheadle and Gatley Urban District Council, died, we regret to state, on the 5th inst., aged sixty.

Mr. G. H. Sleeman, Torquay, has been appointed clerk of works, and Mr. S. D. Tolliday, Portsmouth, cleansing superintendent to the Exeter Town Council.

Mr. Walter Chamberlain, road foreman to the Chesham Urban District Council, has been appointed to a similar position under the Hertford Corporation.

Mr. P. C. Beeston, assistant in the borough surveyor's department, Hemel Hempstead, has been appointed to a similar position under the Romford Rural District Council.

Mr. C. R. Harding, assistant surveyor to the Langport Rural District Council, has been appointed assistant highway surveyor to the Williton (Somerset) Rural District Council, and will take up his new duties on April 5th.

Mr. Frederick Silcock, aged thirty-one, assistant foreman for the past two years under the Bedford Corporation, was on Monday appointed, out of fifty-nine applicants, as road foreman to the Teddington Urban District Council.

Mr. Richard Olver, surveyor to the Launceston Rural District Council, died, we regret to state, last week, aged sixty-eight. His son William has just been elected assistant county surveyor for the Eastern part of Cornwall under the Cornwall County Council, while his other son, Sydney, who lives at Bovey Tracey, is surveyor under the Newton Abbot Rural District Council.

Messrs. H. Howard Humphreys, Westminster, and J. Moncur, county surveyor, Staffs, have been transferred from the class of associate-member to that of member of the Institution of Civil Engineers. Messrs. W. A. Niven, municipal waterworks, Bombay, H. Serridge, borough engineer's department, Durban, and J. A. Staddon, council offices, Watford, have been elected associate-members of the same body.

Mr. R. O. Wynne-Roberts, consulting engineer to the city of Regina, Saskatchewan, has resigned his position owing to the suspension of works due to financial stringency accentuated by the war, and we understand that he will terminate his duties on May 31st next. Mr. Wynne-Roberts has been in Regina for three and a-half years, and during that time has been engaged on waterworks research, development and execution, stockyards and abattoirs, natural gas supply, and other works. He reported to the Provincial Government on a large scheme of power development on the extensive lignite fields, and has been consulted by several local authorities in connection with water supply and other matters. Mr. Wynne-Roberts' impressions of municipal engineering, both in the United States and Canada, are contained in a letter which we recently received from him. "Sewage Disposal, water purification and general construction are," he says, "on a large scale, and the methods are in many ways different, and yet on basic principles are alike, to British. Low temperatures in winter—sometimes as low as 55 deg. Fahr. below zero—and high temperatures in summer—such as 100 deg. Fahr.—are conducive to disintegration, and the problem often is how to counteract atmospheric influences. Moreover, periods of construction in northern latitudes are shorter and more intensive than in the old country, and consequently the methods adopted are in some respects different. Machine trenching and excavation, and other mechanical means for expediting the execution of earthworks, concrete mixing and chuting by various means are in vogue. Compressed-air mixing and chuting is in use in certain places, and concrete conveyed under pressure through pipes is to be seen on bridge work in this province. There are many interesting points in North American engineering which could be studied with advantage by British contractors." Mr. Wynne-Roberts' future plans are not yet decided upon.

The deputation which, at the last meeting of the executive council of the County Councils Association, was appointed to wait on the Chancellor of the Exchequer to urge the desirability of the Road Board continuing its annual grants towards road reconstruction and road crust improvements in the counties will, we learn, consist of the chairman (Lord St. Aldwyn), the Right Hon. H. Hobhouse, Sir W. Ryland, Mr. D. Atkins, M.P., Mr. H. Barber, Mr. A. C. Pain and Mr. H. T. Wakeham (county engineer of Middlesex).

QUERIES AND REPLIES.

We cannot undertake to reply to any queries which are not accompanied by the writer's name and address. These are required as a guarantee of good faith, and not for publication. Sketches accompanying queries should be made separate, on white paper, in plain black ink lines. Lettering or figures should be bold and plain.

Well Boring, Book on. "W. K." inquires for a book by an authority on deep well boring for water supplies, and particularly on the working of the plant used in this work.

Probably the only authoritative book on the subject is "Well Boring for Water, Brine and Oil: A Manual of Current Practice," by C. Isler, hydraulic engineer, second edition, 1911, 10s. 6d. nett.

Calculation of Superficial Areas.—"H. S." writes: Will you inform me whether there has come to your notice a ready reckoner for calculating superficial areas? The ordinary reckoners, as used by glass and timber merchants, only calculate up to a few feet square, and what I want is one that will compute, say, any measurement, progressing by inches, up to about 100 ft. square. If there is a work of this description on the market, I should be pleased to learn of it, as it would considerably facilitate many calculations I have to make daily in squaring out large dimensions of paving, flagging, &c.

The "Radial Area Scale," made by Messrs. Morgan & Kidd, Kew Foot-road, Richmond, Surrey, will probably suit. The price is 3s. 6d. There is also an instrument called the "Areameter" (Reg. No. 65727), but we cannot ascertain where it is obtainable.

FOR OTHER ADVERTISEMENTS
See End of Paper.

BOROUGH OF HEMEL HEMPSTED.
General Assistant wanted immediately in the office of the Borough Surveyor and Waterworks Engineer.
Salary commencing at £80, rising to £100 by annual increments of £5 on approved service.
Forms of application may be obtained from the Borough Surveyor.
Town Hall,
Hemel Hempsted.
March 10, 1915. (2,468)

UNIVERSITY OF LIVERPOOL.

FACULTY OF ARTS.

CHAIR OF CIVIC DESIGN.

The Council invite applications for this Chair, which is associated with the School of Architecture. Salary £400. Residence required from 1 October to 31 March. Professional practice allowed on conditions. Duties to begin 1 October, 1915. Applications, together with the names of three persons to whom reference may be made, and twelve copies of not more than six testimonials, should be forwarded to the undersigned on or before 10 May, 1915. Further particulars regarding conditions and duties may be had on application.

EDWARD CAREY,
Registrar.

(2,472)

BOROUGH OF DARLINGTON.

The Darlington Corporation invites applications for the appointment of

1. A Junior Assistant in the Office of the Borough Surveyor and Waterworks Engineer, at a salary of £90, rising by annual increments of £10 to £110 per annum.

2. A Temporary Architectural Assistant, at a salary of £2 10s. per week for a period of six months.

Applications, in candidate's own handwriting, on Forms which may be obtained from Mr. George Winter, Borough Surveyor, Town Hall, Darlington, accompanied by copies of not more than three recent testimonials, should be properly endorsed and sent to him not later than Monday, the 22nd March instant.

Canvassing strictly prohibited.

HY. G. STEAVENSON,
Town Clerk.

Houndgate,
Darlington,
March 9, 1915. (2,471)

TEDDINGTON URBAN DISTRICT COUNCIL.

CLERK OF WORKS.

The above-named Council require the services of a Clerk of the Works for a period of about nine months to superintend the construction of Concrete Tanks and Filters at their Sewage Works.

Candidates must have had experience in a similar capacity and supervised works of a like character.

Salary £1 4s. per week.

Applications, endorsed "Clerk of Works," stating age and experience, accompanied by copies of three testimonials (which will not be returned) to be sent to the undersigned not later than Saturday, the 20th instant.

Canvassing Members or Officials will be disqualified.

By order,

G. H. SALMONS,
Clerk.

Council Offices,
Teddington.
March 10, 1915. (2,470)

WILTS COUNTY COUNCIL.

COUNTY SURVEYOR'S DEPARTMENT.

Required, a Second Class Clerk. A good Shorthand Writer and Typist. Salary commencing at £60 per annum, rising by annual increments of £5 to £100 per annum. Age 18 to 25.

Form of Application to be obtained from the undersigned must be sent in on or before March 19th.

J. GEORGE POWELL,
County Surveyor.

County Offices,
Trowbridge.
February 23, 1915. (2,469)

BOROUGH OF TIVERTON.

WANTED, WATER FITTER AND TURNCOCK.

Wages 30s. a week. Applicants must be competent Fitters, and with a knowledge of the working of water waste detecting meters.

Further particulars may be obtained from the undersigned, to whom applications, endorsed "Water Fitter," accompanied by copies of not more than three recent testimonials, are to be sent not later than the 27th instant.

J. SIDDALLS,
Borough Surveyor.

Town Hall,
Tiverton.
March 10, 1915. (2,460)

WATFORD URBAN DISTRICT COUNCIL.

HIGHWAY SUPERINTENDENT.

The Council is prepared to consider applications for the position of Highway Superintendent to act under the instructions of the Engineer and Surveyor to the Council, at a salary of £180 per annum, rising by annual increments of £10 to a maximum of £200.

Applicants must be between the ages of 25 and 40 years.

Forms of application and the terms and conditions attaching to the appointment may be had of the undersigned, to whom applications, with copies of three testimonials, must be sent in not later than 9 a.m. Wednesday, 24th March, 1915.

Canvassing any Member of the Council, either directly or indirectly, will disqualify.

W. HUDSON,
Clerk and Solicitor.

Council Offices,
14 High-street,
Watford,
Herts.
March, 1915. (2,466)

KINTYRE DISTRICT.—Interim Road Surveyor wanted immediately for the period of War. Salary at the rate of £250 per annum, to cover all travelling expenses, including the provision, upkeep and running of a motor car or motor cycle. Two copies of testimonials, on or before 23rd instant, to the Clerk, Kintyre District, Campbeltown. (2,464)

BOROUGH OF CONGLETON.

SURVEYOR'S JUNIOR ASSISTANT.

Applications are invited for the temporary appointment during the War of a Junior Assistant in the Surveyor's Department.

Applicants must be neat Draughtsmen, and have a knowledge of levelling, building construction, surveying, drainage [illegible] and will be required to assist the Surveyor generally during the absence of the Sanitary Inspector on active service.

Applications, in candidate's own handwriting, stating age, experience and salary required, accompanied by copies of not more than two recent testimonials, and giving date on which the applicant can commence his duties, must be received by me not later than Monday, 29th March, 1915, endorsed Junior Assistant.

J. H. WALTERS,
Borough Surveyor.

Town Hall, Congleton. (2,462)

COUNTY BOROUGH OF DEWSBURY.

TEMPORARY ENGINEERING ASSISTANT.

Wanted in the Borough Surveyor's Office, a thoroughly Competent Assistant. Applications, stating age, experience, and salary required, to be in my hands not later than the 23rd inst.

HENRY DEARDEN, Assoc.M.Inst.C.E.,
Borough Surveyor.

Town Hall, Dewsbury.
March 9, 1915. (2,459)

GREAT CROSBY URBAN DISTRICT COUNCIL.

The above Council are prepared to receive Tenders for the Supply of the following Materials during the year ending March 31st, 1916, in such quantities and at such times as may be ordered:—

1. Granite Macadam and Chippings.
2. Limestone Chippings.
3. Tarred Limestone Macadam.
4. Portland Cement.
5. Stoneware Pipes, &c.
6. Disinfectants.
7. Pitch and Tar.
8. Incandescent Mantles and Chimneys.
9. Glass for Street Lamps.
10. Horse Provender.
11. Granite Setts.
12. Extra Cart Hire.

Specifications can be obtained from Mr. Joseph A. Wright, Surveyor, Council Offices, Coronation-road, Great Crosby.

Sealed and endorsed Tenders to be delivered to the Council Offices by noon, on March 24th, 1915, addressed to the "Chairman of the Council."

The lowest or any Tender not necessarily accepted.

JOSIAH DEAN,
Clerk to the Council.

March 3rd, 1915. (2,465)

TO PAVING CONTRACTORS.

RICHMOND BRIDGE AND APPROACHES.

REPAVING OF ROADWAY WITH GRANITE.

The Richmond Bridge Commissioners are prepared to receive Tenders for the Repaving with Granite of the Roadway of Richmond Bridge and its Approaches from Hill-street on the Richmond side to the foot of the hill opposite Willoughby-road on the Twickenham side.

The Contract Drawing, Specification, Schedule of Quantities, and Form of Tender may be seen at the Offices of the Clerk to the Commissioners, 24 Hill-street, Richmond, Surrey, or at the Offices of the Engineer, Mr. E. Cruttwell, 2 Queen Anne's-gate, Westminster, on and after Wednesday, 17th March, between the hours of 11 and 4; and copies of the same may be obtained at either office upon payment of Five Guineas, which will be returned upon receipt of a *bonâ-fide* Tender.

Tenders, endorsed "Tender for Repaving," must be delivered under seal at the Offices of the Clerk to the Commissioners, 24 Hill-street, Richmond, Surrey, on or before noon on Wednesday, 31st March next.

The Commissioners do not bind themselves to accept the lowest or any Tender.

J. LESLIE G. POWELL,
Clerk to the Commissioners.

March 10, 1915. (2,474)

URBAN DISTRICT COUNCIL OF WOODBRIDGE.

The above Council invite Tenders for the Supply of 200 tons of Broken Granite, 1½-in. gauge, to be delivered, carriage paid, to Woodbridge (G.E.R.) Station.

Tenders, accompanied by Samples, to be delivered (carriage paid) to Mr. Walter Brooke, Council Offices, Woodbridge; endorsed "Tenders for Granite," on or before the 25th day of March, 1915.

W. GROUT WHISSTOCK,
Surveyor.

Woodbridge.
March 11, 1915. (2,461)

BOROUGH OF GUILDFORD.

The Town Council invite Tenders for the Supply of the following Materials, &c., for a period of 12 months, ending 31st March, 1916:—

Schedule No.
1. Tar-macadam, Broken Granite, Best Basket Slag, and Chippings.
2. Brooms and Brushes.
3. Cast-iron Pipes.
4. Flints.
5. Galvanised Steam Tubes.
6. Disinfectants.
7. Horse Hire and Cartage.
8. Iron Castings.
9. Ironmongery.
10. Lubricating and other Oils, &c.
11. Pitch and Tar.
12. Portland Cement and Lias Lime.
14. Stoneware Pipes, &c.
15. Shoeing, Sharpening Picks, &c.
17. Saddlery, and Harness Repairs.

In the case of Tenders for the Supply of Oils (Schedule No. 10), alternative prices must be quoted for a supply of 3 months, commencing the 1st April, 1915.

All particulars, Specifications, Schedules and Forms of Tender may be obtained on application to the Borough Surveyor, Mr. E. Young Harrison, ASSOC.M.INST.C.E., Tuns Gate, Guildford.

Tenders (each enclosed in a sealed envelope, endorsed "Tender for ——") must be delivered to me, the undersigned, before 12 noon on Monday, March 29th, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

A. D. JENKINS
Town Clerk.

Town Clerk's Office,
Bridge-street, Guildford.
March 10, 1915. (2,463)

CARSHALTON URBAN DISTRICT COUNCIL.

TAR-SPRAYING ROADS.

Tenders are invited for Treating about 90,000 yds. super. (more or less) of Road in this District with Bituminous Dust-preventing Material which will not be harmful to Fish or Vegetation in the Streams into which the surface water runs.

An indemnity to this effect will be required.

Tenders are also invited for Treating about 50,000 yds. super. (more or less) of Road with Best Refined Tar, applied at a temperature of 230 deg. Fahr.

The price in each case to be at per yard, the preliminary work of surface preparation and the after treatment being carried out by the Council. Full details of the Materials to be used, and the method of application, whether by hand or machine, should be supplied.

Tenders, addressed to the Chairman of the Council, marked "Tender for Tar-spraying," to be delivered at this Office not later than 12 noon on Wednesday, 24th March, 1915.

The Council do not bind themselves to accept the lowest or any Tender, and the persons whose Tenders are accepted will be required to enter into the usual contract and bond, which may be seen at this Office.

(By order)
E. W. MORLEY,
Acting Clerk.

District Council Offices,
The Square, Carshalton.
March 11, 1915. (2,473)

ALDERSHOT URBAN DISTRICT COUNCIL.

TENDERS FOR ROAD MATERIALS.

The above Council are prepared to receive Tenders for the Supply of the following:—

Asphalt or Bitumen for road grouting purposes, at per gallon.

6,000 gallons (more or less) Bitumen for road surfacing.

200 tons Slag Tarmac.
120 tons 1½-in. and ¾-in. Tar Paving.
1,000 tons Welsh, Shropshire, or Devon Basalt.
400 yards 2½-in. Red Hungry Hill Flints.
All f.o.r. Aldershot Town Station.

No special Tender Form is needed, but each Firm tendering must state when they can deliver material.

Tenders, endorsed "Road Material," to be sent to W. E. Foster, Esq., Clerk to the Council, not later than 5 p.m. on Tuesday next, 16th March, 1915.

The Council will not necessarily accept the lowest or any Tender that may be sent in.

Municipal Buildings,
Aldershot.
March 10, 1915. (2,458)

THE URBAN DISTRICT COUNCIL OF WIMBLEDON.

TENDERS FOR MATERIALS, FODDER, &c.

The Council are prepared to receive Tenders for the Supply of the following:—

During year to 31st March, 1916.

ROAD MATERIALS.

1½-in., 2-in. and 2½-in. Leicestershire or other Granite, Granite Chippings, Quartzite, Tar-macadam, Tar Paving, Farnham Hungry Hill Flints, Fine Footpath Gravel.

CARTING, &c.

Carting of Road Materials, Day-work Carting.
Hire of a 10-ton Steam Roller.

During half-year to 30th September, 1915.

Oats, Hay, Straw, & Chaff for the Council's Stables, Bagshot.

Shoeing the Council's Horses.

Forms of Tender and other particulars may be obtained of Mr. W. Dickinson Bell, Surveyor, Council Offices, Bagshot.

Sealed Tenders, marked "Tender for ——," must be delivered to me, the undersigned, not later than 12 noon on Wednesday, the 24th day of March, 1915.

The Council will not be bound to accept any Tender.

EDWYN T. CLOSE,
Clerk of the Council.

Council Offices,
Bagshot.
March 10, 1915. (2,467)

WATER SUPPLY IN THE BERMUDAS.

HOUSE ROOFS AS CATCHMENT AREAS.

The water supply [illegible] the Bermudas [illegible] Mr. G. Bertram Kershaw in a paper read [illegible] Institute of Sanitary Engineers. [illegible] engineering [illegible] Bermuda, [illegible] underground water [illegible] Hamilton, [illegible] contain as much as 100 parts of chlorine per 100,000 [illegible] caused [illegible] drinking purposes. [illegible] Hamilton [illegible] environments [illegible] underground water [illegible] caused by seepage from the large number of cesspools [illegible] on the rock. Boring operations [illegible] water [illegible] found at Paget [illegible] no water was obtained [illegible] a depth of 1,400 ft. [illegible] been pushed [illegible] boring was suspended. All the rock [illegible] the islands are [illegible] with shallow wells about [illegible] ft. high, running [illegible] the level of the [illegible] sinking and [illegible] which [illegible] on them [illegible] pipe connected with the rain water storage tank or tanks.

The [illegible] are [illegible] of cut [illegible] the solid rock [illegible] and not [illegible] although [illegible] concrete [illegible] ing the water being [illegible] to pumps when required [illegible] to [illegible] for the purpose. The larger houses have additional "catches," as they are locally termed, formed by cutting the rock on higher ground, excavating a flat surrounding gutters at the [illegible] point leading to the storage tank. Sometimes the catch is rendered with cement, and it may be mentioned that the limestone takes rendering excellently.

The water is not, as a rule, filtered before use, and if used for drinking purposes is almost invariably boiled. It must be borne in mind, in connection with the [illegible] of the paper, that [illegible] are needed [illegible] and consequently there is little [illegible] to be reckoned with.

The capacities of [illegible] water tanks [illegible] vary greatly, even in the case of [illegible] houses, according to the means and individuality of the owner. In some cases they have a capacity of several thousand gallons, but, generally speaking, they are not large enough.

The water, in Mr. Kershaw's opinion, should certainly invariably be carefully filtered before being drunk. [illegible] should be applied [illegible] to the water [illegible] rain [illegible] drinking purposes, and not placed in it.

The [illegible] water used per head [illegible] varies [illegible] considerably, [illegible] that with the exception of the hotels and the larger houses, the quantity was little, if anything, in excess of [illegible] per head per day when there were no baths. In the case of the larger hotels, however, which are largely patronised by Americans, the amount of water used per head per day is [illegible] ten times this quantity.

A Glossary of Road Terms (By H. Percy Boulnois, M.INST.C.E., St. Bride's Press, Limited, 24 Bride-lane, E.C., Price 2s. nett).—The movement towards standardising the principal roads throughout the United Kingdom has rendered it necessary to correlate the nomenclature of road terms in use in different districts, and Mr. Boulnois has compiled a glossary with the hope that it may form a basis for such a correlation.—*Times Engineering Supplement.*

Flies and Mosquitoes. Mosquitoes and flies are unfortunately [illegible] observed Mr. G. Bertram Kershaw at last week's meeting of the Institute of Sanitary Engineers, [illegible] common in Bermuda, and both *Anopheles* and *Stegomyia* mosquitoes are plentiful. The larvæ, or "wiggle-tails," can be seen at the surface of most wayside pools. Something towards destroying the insect in the larval stage has been effected by kerosene poured on to such stagnant pools. Fish will feed greedily upon the larvæ, and in some of the West Indian islands natives sometimes keep one or two small fish of the "top minnow" variety in their drinking-water cisterns—not, however, with the idea of keeping down mosquito larvæ, but with a view to ascertaining whether any of their friends or relatives have poisoned the water. The common housefly occurs in very large quantities, and doubtless plays a very considerable part in disseminating disease. A mixture of formalin and water, to which a little sugar had been added, proved an irresistible attraction to the flies, half a dustpan full of flies being swept up shortly after the plates containing the mixture had been put down.

RUNNING COSTS OF MOTOR VEHICLES.

PAPER AT THE SOCIETY OF ENGINEERS.

Lieut. Robert W. A. Brewer, ASSOC.M.INST.C.E., [illegible] read [illegible] a paper on "Running Costs of Motor Vehicles," read before the Society of Engineers on the 1st inst, stated that the problem before the automobile engineer was to transport persons and goods in a minimum of time and at a minimum cost. The second consideration was, perhaps, the more important, and could be profitably discussed from an engineering standpoint. The main heads under which expenses might be classified were: [illegible]

As regarded fuel cost, it could not be said that a powerful engine was proportionately a greater fuel consumer than a similar one of less power, and the author discussed the factors producing economy in the use of fuel. The question of efficient lubrication was of the highest importance, but little progress had yet been made, and further experiments were necessary. Piston friction also required more investigation, the most suitable form and material and the appropriate number of rings for a given type of car being yet undecided; attention was also directed to the problem of piston clearance. In valve mechanism there was little room for improvement, but the transmission losses had not yet been reduced to a minimum.

Gas friction caused loss due to the reduction of the volumetric efficiency of the engine, and efficient carburation played an important part in reducing loss from this cause, while changes of direction of flow should be made as easy as possible. At all diversions of the flow path a sufficiently high wall temperature must be provided to prevent precipitation. It was not so much the quantity of heat as its application at the correct points that was of the highest importance.

The author criticised the usual method of conducting fuel consumption tests, and indicated the importance of using an accelerometer when making such tests. The variation of the power required to drive a car was due largely to wind and rolling resistances. Total car resistance was also influenced by the balance of the wheels, engine parts, and propeller shafts.

UCKFIELD COUNCIL AND THE MILITARY AUTHORITIES.

[illegible] Uckfield Rural District Council on Monday a letter was received (as reported by [illegible] from Lieutenant-Colonel Walters, the officer commanding the 1st London Division Royal Engineers, at Crowborough Camp, in the following terms: "With reference to previous correspondence regarding your surveyor entering on War Department premises at the Beacon, and your claim to allow him to do so, I now beg to call your attention to the Public Health Act, 1875, 38 and 39 Vic., Cap. 55, which says: 'Nothing in this Act shall be construed to authorise any local authority to disturb or interfere with any lands or other property vested in H.M. Principal Secretary of State for the War Department for the time being without consent, in every case, of such Secretary of State, such consent to be expressed in writing.'"

The clerk explained that this was a case where the military authorities laid a drain to the council's sewer without their consent. Hearing that their sanitary surveyor, Mr. J. Taylor, examined the sewer to see if it was connected up properly, the military complained that he had no right to interfere in the matter. The section quoted by Lieutenant-Colonel Walters did not give the military power to lay a drain to the council's sewer.

The chairman (Major R. L. Thompson): I think we had better leave it to the clerk to fight out.

The clerk suggested that all the council need do was to write pointing out that the military had no power to connect a drain to their sewer without consent.

This course was adopted.

Treatment of Damp Walls.—We are informed that the walls of the police station at Worcester, which were frequently damp, have been completely cured by a rendering of Pudlo cement.

DAMAGE TO ROADS BY HEAVY MOTORS.

EXPERT COMMITTEE APPOINTED.

It is officially announced that, in view of the complaints which have been made as to the alleged excessive damage caused to roads by certain classes of heavy motors and locomotives, the Right Hon. Herbert Samuel, M.P., President of the Local Government Board, has appointed a small expert committee to inquire into the sufficiency of the existing requirements with respect to the construction of these vehicles, including weights on wheels, widths of tyres, diameters of wheels, &c. The terms of reference are: "To consider the law and regulations relating to the construction and use of road locomotives and heavy motor cars in Great Britain, and to report what amendments, if any, are desirable." The committee will consist of:—

Mr. E. Shortt, K.C., M.P. (chairman);
Mr. A. G. G. Asher, county clerk of Midlothian;
Mr. P. M. Crosthwaite, M.INST.C.E., engineering inspector to the Local Government Board;
Mr. H. Howard Humphreys, ASSOC.M.INST.C.E., a well-known road engineer and witness at Local Government Board inquiries held into the proposed closing of roads against heavy traffic;
Mr. E. J. Lovegrove, M.INST.C.E., borough surveyor of Hornsey;
Mr. J. E. Thornycroft, ASSOC.M.INST.C.E.;
Mr. J. Willmot, F.S.I., county surveyor of Warwickshire;

with Mr. R. J. Simpson, of the Local Government Board, as secretary.

In connection with the general question of the user of roads by heavy motors, it is understood that a joint select committee to consider questions relating to contributions by motor omnibuses to the cost of road maintenance is also contemplated.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

EASTERN DISTRICT.

An Eastern District meeting will be held at the offices of the Institution, 92 Victoria-street, Westminster, S.W., to-morrow (Saturday).

4 p.m.—Meeting of Executive Committee.

AGENDA.

(1) To consider annual report.
(2) Suggestions for arrangements of future meetings.

4.30 p.m. Meeting of the members of the Eastern District.

AGENDA.

(1) Minutes of previous meeting held at Tilbury.
(2) Election of Executive Committee.
(3) Election of Chairman.
(4) Election of district representatives.
(5) Election of honorary secretary.
(6) Suggestions as to arrangements for future meetings.
(7) A discussion on the use of bituminous [illegible] in road construction.

SOUTH WALES DISTRICT.

A South Wales District meeting will be held at City Hall, Cardiff (by the kind consent of the Cardiff Corporation), on Saturday, March 27th, at 2.15 p.m.

AGENDA.

(1) To read the minutes of the last meeting.
(2) To elect a district secretary.
(3) To receive nominations for district representative.
(4) To elect a district chairman.
(5) To elect a district executive committee.
(6) Paper by Mr. D. M. Jenkins (member), Neath: "Notes on Extraordinary Traffic on Highways."
(7) Other business, if any.

H. ALEX. CLARKE.
Hon. District Secretary.

Briton Ferry.

Glasgow Town Planning Schemes.—The town planning scheme of the Glasgow Corporation was the subject of an inquiry conducted recently in the City Chambers by Mr. Walker Smith, on behalf of the Local Government Board for Scotland. The scheme embraces lands in the districts of Kelvinside, Temple, Jordanhill, Broomhill, Whiteinch, Scotstoun, Yoker (East), Drumchapel, Scotstounhill, and Knightswood, and includes in its main features the construction of a wide thoroughfare from Anniesland to Clydebank burgh boundary. Part of the area is situated in Dumbartonshire, and another part in Renfrewshire, and the local authority in each county, who have competing town planning schemes, are the principal objectors. Evidence was given by Mr. Thomas Nisbet, master of works, Glasgow, Mr. David Dunbar, sanitary inspector for the county of Dumbarton, and Mr. James M. Low, surveyor for the Upper District of Renfrew.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of* SITUATIONS. *Such advertisements may, in cases of emergency only, be telephoned (City No. 7070) subject to later confirmation by letter.*

TEMPORARY TOWN PLANNING ASSISTANT.—March 15th.—Hazel Grove and Bramhall Urban District Council. £2 5s. per week.—Mr. G. Severn Doncaster, surveyor, Public Offices, Hazel Grove.

WORKS SUPERINTENDENT.—March 15th.—West Ham Town Council. £250 per annum.—Mr. J. S. D. Moffat, tramways manager, Tramway Offices, Greengate-street, Plaistow, E.

SUPERINTENDENT OF HIGHWAYS AND GENERAL FOREMAN.—March 15th.—West Hartlepool Town Council. £156 a year.—Mr. Nelson F. Dennis, borough engineer, Municipal Buildings, West Hartlepool.

SANITARY INSPECTOR.—March 15th.—Ardsley East and West Urban District Council. £80 per annum.—Mr. E. H. Middlebrook, clerk, 71 Queen-street, Morley, near Leeds.

TEMPORARY ARCHITECTURAL ASSISTANT.—March 15th.—Huddersfield Town Council. £120 per annum.—Mr. K. F. Campbell, borough engineer, 1 Peel-street, Huddersfield.

MECHANICAL ENGINEER.—March 16th.—North Bromsgrove Urban District Council.—Mr. Francis T. Levens, clerk, 110 High-street, Bromsgrove.

COUNTY SURVEYOR.—March 20th.—Notts County Council. £500 per annum.—Mr. H. Hampton Copnall, clerk, Shire Hall, Nottingham.

CLERK OF WORKS.—March 20th.—Blaenavon Urban District Council. £130 per annum.—Mr. I. G. G. Thomas, clerk.

CLERK OF WORKS.—March 20th.—Rothwell Urban District Council. £3 per week.—Mr. W. Dodgson, clerk, Council Offices, Rothwell, Leeds.

ASSISTANTS.—March 22nd.—Darlington Town Council. £90—£110 per annum.—Mr. G. Winter, borough surveyor.

TEMPORARY ARCHITECTURAL ASSISTANT.—March 22nd.—Darlington Town Council. £2 10s. per week.—Mr. G. Winter, borough surveyor.

BOROUGH ENGINEER AND SURVEYOR.—March 22nd.—Corporation of Mansfield. £400—£600 per annum.—Mr. J. Harrop White, town clerk.

CLERK DRAUGHTSMAN.—March 23rd.—East Suffolk County Council. £90—£120 per annum.—Mr. W. Jervis, county road surveyor, County Hall, Ipswich.

BOROUGH SURVEYOR AND ENGINEER.—March 24th.—Corporation of Stockton-on-Tees. £500—£700.—Mr. Arthur B. Crosby, town clerk, Borough Hall, Stockton-on-Tees.

SANITARY INSPECTOR.—March 25th.—Sutherland County Council. £120 per annum.—Mr. A. Argo, county clerk, Golspie, Sutherlandshire.

SURVEYOR OF HIGHWAYS.—March 25th.—Abingdon Rural District Council. £2 10s., to a maximum of £150.—Messrs. B. & E. M. Challoner, clerk, 67 Stert-street, Abingdon.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

DRAUGHTSMAN.—Nigerian Government Railway. £300–£360 per annum. Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

DRAUGHTSMEN.—Sierra Leone Government, Public Works Department. £300–£350. Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

TEMPORARY CLERK.—Acton Urban District Council. £3 3s. per week. Mr. F. Sadler, surveyor, Council Offices, Acton, W.

ASSISTANT ENGINEERS.—Public Works Department, Gold Coast. £350–£400. Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency, be telephoned (City No. 1056) subject to later confirmation by letter.*

GALLMIRE.—Designs for a small hospital, for the Galemire (Whitehaven) Joint Hospital Committee.—Mr. E. B. Croasdell, clerk, Union Hall, Whitehaven.

STEPNEY.—Designs for municipal buildings, for the borough council. Mr. H. T. Hare, F.R.I.B.A., has been appointed assessor.—Mr. G. W. Cutler, town clerk, 15 Great Alie-street, Whitechapel.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency, be telephoned (City No. 1056) subject to later confirmation by letter.*

Buildings.

EAST SUFFOLK.—March 16th.—For the erection of a hospital, for the county council.—Mr. H. M. Conlin, architect, The Thoroughfare, Butter Market, Ipswich.

MORLEY.—March 16th.—For the erection of a coal store at the gasworks, for the corporation.—Mr. F. Turner, town hall, Morley.

HUDDERSFIELD.—March 17th.—For the erection of a storage shed at the tramway depot, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

HAMPSHIRE.—March 17th.—For the erection of a school, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

OLDHAM.—March 18th.—For the erection of a rubble retaining wall, for the corporation.—Borough Surveyor.

GLASGOW.—March 18th.—For the erection of a school, for the School Board.—Master of Works, 129 Bath-street, Glasgow.

CARDIFF.—March 18th.—For the supply and erection of a shed, for the corporation.—City Engineer.

DARLINGTON.—March 18th.—For the extension of the electric power station, for the corporation.—Mr. G. Winter, borough surveyor.

WALLASEY.—March 18th.—For the erection of workshop and men's room, and the construction of foundation for gas engine, for the corporation.—Mr. J. H. Crowther, engineer and manager of the gasworks, Limekiln-lane, Wallasey.

READING.—March 18th.—For the erection of a public convenience, for the corporation.—Mr. J. Bowen, borough engineer and surveyor.

DONCASTER.—March 19th.—For the extension of the reservoir, for the rural district council.—Mr. W. R. Crabtree, surveyor.

HEMSWORTH.—March 20th.—For laying water mains, for the rural district council.—Mr. T. H. Richardson, engineer, Hemsworth.

STEVENAGE.—March 22nd.—For the erection of eight cottages, for the urban district council.—The Surveyor.

TUNBRIDGE WELLS.—March 22nd.—For the erection of an engine-house and engine foundations, for the corporation.—Mr. W. H. Maxwell, borough waterworks engineer.

MONMOUTH.—March 22nd.—For the erection of a domestic arts centre, for the Education Committee.—Mr. J. Bain, County Council Offices, Newport, Mon.

CHELMSFORD.—March 22nd.—For the erection of an engine-house and incidental works, for the corporation.—Mr. P. T. Harrison, borough engineer.

DROMORE.—March 23rd.—For the erection of twenty-one cottages, for the rural district council.—Mr. N. Naughton, clerk.

EPSOM.—March 23rd.—For the erection of ten cottages, for the rural district council.—Mr. A. C. Williams, architect and surveyor, Council Offices.

SOUTHALL-NORWOOD.—March 23rd.—For the erection of fifty-four houses, for the urban district council.—Mr. R. Brown, engineer and surveyor, Southall.

SHEFFIELD.—March 24th.—For the erection of public conveniences in various parts of the city, for the Health Committee of the Sheffield City Council.—Mr. Charles F. Wike, city engineer, Town Hall.

MANCHESTER.—March 24th.—For the erection of baths, for the Baths Committee.—City Architect, Town Hall.

NORTHAMPTON.—March 25th.—For the erection of twenty cottages, for the corporation.—Waterworks Office, Fish-street, Northampton.

SPALDING.—March 27th.—For the erection of three cottages and outbuildings, for the rural district council.—Mr. H. Dowse & Crowder, architects, 6 Double-street, Spalding.

CARMARTHEN.—March 31st.—For the erection of a school, for the county council.—Mr. W. V. Morgan, county architect, County Education Offices, Carmarthen.

ANGLESEY.—April 7th.—For the erection of new schools, for the Education Committee.—Mr. J. Owen, county architect, Menai Bridge.

Iron and Steel.

COVENTRY.—March 15th.—For the supply of cast-iron pipes, steel pipes, and bends and valve boxes, for the corporation.—The Water Engineer, St. Mary's Hall, Coventry.

CHELMSFORD.—March 17th.—For the supply of pumping machinery, and for the provision and erection of a pumping installation, complete with all incidental works, for the corporation.—Mr. Percival T. Harrison, borough engineer.

DARLINGTON.—March 18th.—For the construction of two dry-lute purifiers at the gasworks, for the corporation.—Mr. F. P. Tarratt, gasworks engineer.

WALLASEY.—March 18th.—For the supply and delivery at the gasworks and coke-screening plant at the gasworks, for the corporation.—Mr. J. H. Crowther, engineer and manager, Limekiln-lane, Wallasey.

HEMSWORTH.—March 20th.—For supplying and laying cast-iron mains, for the rural district council.—Mr. T. H. Richardson, engineer, Hemsworth.

BELPER.—March 25th.—For providing and laying cast-iron pumping main, for the urban district council.—Messrs. G. & F. W. Hodson, Bank Chambers, Loughborough.

CARMARTHEN.—March 26th.—For providing and laying water mains, for the rural district council.—Mr. W. E. Jones, surveyor, Rock Hill, Llanarthney.

Roads.

BRADFIELD.—March 15th.—For the repair of the district roads, for the rural district council.—Mr. B. A. Collins, clerk, 172 Friar-street, Reading.

LLANFRECHFA UPPER.—March 15th.—For road metalling and hauling, for the urban district council.—Mr. T. Titley, deputy surveyor, Commercial-street, Pontnewydd.

LANARK.—March 15th.—For executing works of granolithic paving, kerb and channel, for the District Committee of the Middle Ward.—Mr. R. Spittal, road surveyor, District Offices, Hamilton.

PLYMOUTH.—March 15th.—For making up several streets, for the corporation.—Mr. J. Paton, borough engineer.

HAZEL GROVE.—March 16th.—For the supply of broken stone, setts, kerbs and chippings, for the urban district council.—Mr. G. Severn Doncaster, surveyor.

KIDDERMINSTER.—March 16th.—For the supply of broken granite, granite screenings, broken slag, and slag screenings, for the rural district council.—Mr. G. J. Shepherd, surveyor, 85 Chester-road, Kidderminster.

WARE.—March 16th.—For the supply of tar-macadam and granite, for the urban district council.—Mr. G. H. Gisby, clerk.

STROUD.—March 16th.—For the supply of granite, basalt, limestone, and tarred macadam, for the urban district council.—Mr. E. N. Witchell, clerk.

THURNSCOE.—March 16th.—For the supply of broken granite, granite chippings, broken slag, slag screenings, flags, kerbs, channelling, and asphalt, for the urban district council.—Mr. T. Bull, surveyor.

KNARESBOROUGH.—March 16th.—For the supply of road materials, for the rural district council.—Highway Surveyor, 14 Bower-road, Harrogate.

MOUNTAIN ASH.—March 16th.—For the supply of broken limestone, gravel, native stone, and haulage, for the urban district council.—Mr. W. G. Thomas, surveyor.

BARTON.—March 16th.—For the supply of setts, kerbs, macadam, flags, and limestone chippings, for the rural district council.—Mr. A. H. Mountain, surveyor, Union Offices, Patricroft, Lancs.

FORDEN.—March 16th.—For the supply of broken and unbroken stones, for the rural district council.—The Surveyor, Forden, Montgomery.

CAERPHILLY.—March 16th.—For the supply of granite chippings, broken limestone, distilled tar, and scavenging, for the urban district council.—Mr. Alfred O. Harpur, surveyor.

REIGATE.—March 17th.—For tar-washing 130,000 yds. super. of roads, for the corporation.—Mr. A. Smith, town clerk.

CRANBROOK.—March 17th.—For the supply of road materials, for the rural district council.—Mr. S. F. Williams, acting clerk, Cranbrook.

TUTBURY.—March 17th.—For the supply of broken granite and limestone, for the rural district council.—Mr. F. Rist, surveyor, Tatenhill, Burton-on-Trent.

ELY.—March 17th.—For the supply of 3,150 tons of granite, and 1,050 tons of gravel, for the rural district council.—Mr. F. W. Firby, district surveyor, Sutton, Isle of Ely.

EASTBOURNE.—March 17th.—For the supply of Kentish ragstone, Portslade flints, compo. sand, tar, hand-picked flints, and cartage, for the rural district council.—Mr. C. M. Carter, district surveyor, Mount Sorrel, Hampden Park, Eastbourne.

NELSON.—March 17th.—For the supply of granite macadam, limestone macadam, paving chippings, pitch, cement, flags, kerb, grit setts, and creosote oil, for the corporation.—Mr. W. Shackleton, borough engineer and surveyor.

DONCASTER.—March 18th.—For the supply of dross, granite, carting, and manual labour, for the rural district council.—Mr. W. R. Crabtree, highway surveyor.

CHAILEY.—March 18th.—For the supply of flints, quartzite, Kentish rag, Mendip stone, and gravel, for the rural district council.—Mr. H. Kemp Walls, district surveyor, North Common, Chailey.

STOCKPORT.—March 18th.—For making up two streets, for the corporation.—Mr. J. Atkinson, borough surveyor.

LANCHESTER.—March 18th.—For the supply of limestone, whinstone, slag, and tarred slag, for the rural district council.—Mr. W. Cummings, highway surveyor.

GLASGOW.—March 18th.—For the supply of 40,000 tons of whin metal, for the corporation.—Mr. T. Melvin, general manager, sewage department, 72 Ingram-street.

REIGATE.—March 19th.—For private street works, for the rural district council.—Mr. A. J. Head, surveyor, 48 High-street, Reigate.

HORBURY.—March 19th.—For the supply of Tarmac, granite, whinstone, dross, flags, kerbs and setts, for the urban district council.—Mr. W. Sugars, engineer and surveyor.

HULL.—March 19th.—For the supply of macadam, for the corporation.—Mr. F. W. Bricknell, acting city engineer.

TRING.—March 20th.—For the supply of broken granite, chippings, flints, and hoggin, for the urban district council.—Mr. S. S. Gettings, surveyor.

COSFORD.—March 20th.—For the supply of granite, local pit stones, and repair of roads, for the rural district council.—Mr. W. B. Fairchild, surveyor, Lavenham, Suffolk.

STAINES.—March 20th.—For the supply of granite, tarred macadam, and granite chippings, for the urban district council.—Mr. E. J. Barrett, engineer and surveyor.

BURNLEY.—March 20th.—For the supply of local setts, flags, kerb and channel, for the corporation.—Mr. G. H. Pickles, borough engineer.

OSWESTRY.—March 20th.—For the supply of broken granite and broken and unbroken limestone, for the rural district council.—Mr. C. H. Bull, clerk.

SOUTHBOROUGH.—March 20th.—For the supply of 800 tons of basalt, granite, or other suitable stone, for the urban district council.—The Surveyor.

KIVETON PARK.—March 20th.—For the supply of broken slag, granite and tar-macadam, for the rural district council.—Mr. F. Hewitt, surveyor.

ILKESTON.—March 22nd.—For the supply of 2,000 tons of tar-macadam, 350 tons of broken granite, 1,500 tons of furnace slag, 100 tons of granite setts, and 500 yds. of kerbs, for the corporation.—Mr. Henry Jas. Kilford, borough surveyor.

CASTLEFORD.—March 22nd.—For works of street improvement, for the urban district council.—Mr. W. Green, surveyor.

COVENTRY.—March 22nd.—For the supply of broken road stone, granite kerbs, granite setts, stoneware pipes, castings, and workmen's tools, for the corporation.—City Engineer.

EARSDON.—March 22nd.—For the supply of hand-broken whinstone slag, whinstone kerb, and cartage, for the urban district council.—Mr. J. R. McMillen, surveyor, Council Offices, Shiremoor, Northumberland.

WEMBLEY.—March 23rd.—For making up two roads, for the urban district council.—Mr. C. R. W. Chapman, surveyor.

POOLE.—March 23rd.—For the supply of granite and basalt, for the corporation.—Mr. S. J. Newman, borough surveyor.

MOUNTAIN ASH.—March 23rd.—For the execution of street works, for the urban district council.—Mr. W. G. Thomas, surveyor.

FARNHAM.—March 23rd.—For cleansing and tar-painting road surfaces, for the urban district council. The Surveyor.

PERSHORE.—March 23rd.—For the supply of stone and stone hauling in the district, for the rural district council.—Mr. A. E. Baker, clerk.

CLAYTON-LE-MOORS.—March 23rd.—For the supply of road materials, for the urban district council.—Mr. V. Dodgson, surveyor.

WANSTEAD.—March 24th.—For tar-dressing the district roads, for the urban district council.—The Surveyor.

BREDBURY AND ROMILEY.—March 24th.—For the supply of road materials, for the urban district council.—The Surveyor, School Brow, Romiley.

ORMSKIRK.—March 24th.—For the supply of road materials, for the urban district council.—Mr. H. W. Chadwick, surveyor.

OXFORD.—March 24th.—For the supply of road materials, for the corporation.—Mr. W. H. White, city engineer.

WESTHOUGHTON.—March 24th.—For a steam road roller and scarifier, nominal weight of roller empty to be 10 tons, for the urban district council.—Mr. Thos. Partington, clerk.

EAST STOW.—March 24th.—For making up Victoria-road, Stowupland, for the rural district council. Mr. H. E. Wilkes, clerk, Market-place, Stowmarket

STROOD.—March 24th.—For the supply of road materials, for the rural district council.—Mr. L. Randerson, surveyor, Meopham, near Gravesend.

PETERBOROUGH.—March 25th.—For the supply of broken granite, granite kerb, and granite channelling, for the corporation.—Mr. J. W. Walshaw, city surveyor.

WILMSLOW.—March 27th.—For paving two roads with granite setts, for the urban district council.—Mr. A. S. Cartwright, surveyor.

EAST GRINSTEAD.—March 27th.—For the supply of tarred slag macadam, fine slag chippings, granite, granite chippings, Kentish ragstone, hand-picked surface flints (broken), clean brick rubble and steam rolling, for the urban district council.—Mr. W. E. Woollam, engineer and surveyor.

GATESHEAD.—March 27th.—For the supply of road materials, for the corporation.—Mr. N. P. Pattinson, borough engineer.

WATH-UPON-DEARNE.—March 29th.—For the supply of macadam, tar-macadam, kerbs, flags, and setts, for the urban district council.—Mr. J. H. Drew, [illegible] surveyor.

DROXFORD.—March [illegible] council.—Mr. J. King, surveyor, Droxford, Hants.

GATESHEAD.—March [illegible] Parliament Buildings, Edinburgh.

MIDLOTHIAN.—March [illegible] County Buildings, Edinburgh.

GLASGOW.—March [illegible]

Sanitary.

ALCESTER.—March 16th.—For scavenging certain districts, for the rural district council.—Mr. C. B. Machin, sanitary inspector.

THURROCK.—March [illegible] of about 4 miles of stoneware and iron sewers of 9-in., 12-in. and 15-in. diameter, together with manholes and other appurtenances, for the Thurrock, Grays and Tilbury Joint Sewerage Board.—Mr. G. Midgley Taylor, engineer, Caxton House, Westminster, S.W.

AYLESBURY.—March [illegible] removal of house refuse, for the rural district council. —Mr. R. T. Stewart, sanitary surveyor.

LANCHESTER.—March 16th.—For laying earthenware and cast-iron sewers, for the rural district council.—Mr. J. R. Lupton, surveyor.

SWANSEA.—March 17th.—For the construction of stoneware pipe sewers and manholes, for the corporation. [illegible]

WANDSWORTH.—March 17th.—For surface-water [illegible] High-road, S.W.

ECCLES.—March 20th.—For the construction of about 500 lin. yds. of egg-shaped sewer, 72 lin. yds. [illegible] sewer, eleven manholes, and additions and alterations [illegible] Mr. Thomas S. Picton, borough engineer.

WAKEFIELD.—March [illegible] for the corporation.—Mr. J. P. Wakeford, city surveyor.

LARKFIELD.—March [illegible] trict, for the urban district council. Mr. J. R. McMillen, surveyor, Council Offices, Shiremoor, Northumberland.

INCE.—March [illegible] sewage disposal works, for the urban district council. —Mr. A. T. Swain, engineer and surveyor.

FINCHLEY.—March 24th.—For the construction of four clinker sewage filters, for the urban district council.—Mr. C. J. Jenkin, engineer, Council Offices.

WEST LANCASHIRE.—March 24th.—For the removal of house refuse, for the rural district council.—Mr. J. Ainsworth, inspector, Banks, near Southport.

CRANBROOK.—March 29th.—For the construction of sewage disposal works, for the rural district council.—Mr. J. H. Bailey, sanitary surveyor.

Stores.

HEYWOOD.—March [illegible] earthenware pipes, bends, junctions, taper pipes, traps, gullies, setts, kerbs, flags, pitch, creosote oil, limestone chippings, granite macadam, granite chippings, [illegible] and refilling machine brush, and paraffin oil, for the corporation.—Mr. J. B. Nuttall, borough surveyor.

LEEK.—March 22nd.—For the supply of flags, kerbs, channels, setts, macadam stone, chippings, limestone and slag tar-macadam, Portland cement, sanitary pipes, pitch, oil, scavengers' bass brooms, cast-iron manhole and lamphole covers, galvanised malleable manhole step irons, cast-iron gullies and frames, [illegible] Mr. E. Beacham, engineer and surveyor.

EASTBOURNE.—March 22nd.—For the supply of Portland cement, cast-iron goods, wrought-iron goods, tools, miscellaneous ironmongery, oils, colours, glazed stoneware pipes, brooms and brushes, for the corporation. [illegible]

KENT.—March 27th.—For the supply of shovels, forks, scavenging brooms, scoops, scrapers, cart grease, tallow, oil, tools, and other materials, for the county council.—Mr. W. B. Prosser, clerk, Sessions House, Maidstone.

ROTHERHAM.—March 27th.—For the supply of broken granite, broken slag, tarred slag, tarred limestone, concrete flags, Portland cement, timber, pitch and creosote oil, grit-stone setts and kerbs, granite setts, and cast-iron pipes, for the corporation.—[illegible]

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.

[illegible] for the supply of [illegible] Sutton district [illegible] Mr. [illegible]

[illegible] Tenders [illegible] & Partners, [illegible] Mr. [illegible]

[illegible] Mr. [illegible]

[illegible] sewers, manholes, cast-iron pipes, tanks, filters, and other works, for the urban district council.—Messrs. Dodd & [illegible]

[illegible]	[illegible]
Johnson & Langley, Leicester	16,941
[illegible]	[illegible]
J. J. Shardlow, Leicester	15,012
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

				s. d.			
[illegible]							
Groby Granite Company	13	5	[illegible]				
[illegible] Company			13	8	[illegible]	12	
[illegible] pany	13	11	[illegible]				
Whitwick Granite Company	13	11	[illegible]				
Lavender & Bateman	14	1	14	1	11	0	13	9
Ellis & Everard	14	2	14	2	12	6	12	6
[illegible]								
A. & F. Manuelle	15	0	15	0	15	0	15	0
Brookes, Limited	16	0	16	0	16	0	16	0

[illegible] water [illegible] Rural [illegible] engineer, [illegible]

[illegible]	[illegible]
[illegible]	2,112
[illegible]	2,108
Staveley Coal and Iron Company, Chesterfield	2,030
[illegible]	[illegible]
[illegible]	2,014
[illegible]	1,940

[illegible] sewer ironwork, galvanised dirt boxes, and sewer ventilating columns, for the corporation.—Mr. W. T. Lancashire. [illegible]

[illegible] schedule: Leeds Fireclay Company, Limited, Leeds, schedule: Middleton Fireclay Works, Leeds, schedule.
Sewer Ironwork.—J. Henry, Limited, Leeds, schedule.
Galvanised Dirt Boxes.—F. Verity & Sons, Leeds, schedule.
Sewer Ventilating Columns.—Heywood & Porteus, Gomersal, near Leeds, schedule.

MANSFIELD-WOODHOUSE.—For the reconstruction of [illegible] council.—Mr. F. P. Cook, surveyor:—

E. Somerfield, West Bridgeford	£4,945
[illegible]	[illegible]
Lane Brothers, Mansfield	4,222
[illegible]	[illegible]
[illegible]	[illegible]
H. Bennett, Mansfield	3,835
[illegible]	[illegible]

NEWMARKET.—[illegible] for the supply of [illegible] Leicestershire granite and tarmacadam materials [illegible] for the [illegible] district council.—Mr. W. H. Ellis, surveyor:—

Whitwick Granite Company, Leicester, 2in. to 1½-in. granite, delivered at Newmarket, 12s. 10d.; delivered at Burwell, 12s. 4d. ¾-in. to ½-in. granite chippings, delivered at Newmarket, 11s. 7d.; delivered at Burwell, 11s. 1d. ¾-in. to ½-in. granite, delivered at Newmarket, 12s. 7d.; delivered at Burwell, 12s. 1d. ¾-in. to ½-in. tarviated [illegible] delivered at Newmarket [illegible] delivered at Burwell, 10s. 10d. ¾-in. to ½-in. tarviated [illegible] delivered at Newmarket [illegible] delivered at Burwell, 20s. 8d.

PENYBONT.—For the construction of new roads, for the rural district council. Mr. E. Jenkins, surveyor :—

Road Diversion near Sutton

T. D. Evans, Bridgend	£1,615
W. & J. R. Watson, Limited, Bridgend	1,501
D. J. Davies, Bridgend	1,281
W. A. Jones, Bridgend	1,244
D. Llewellyn, Bridgend	1,240
G. Jones, Bridgend	1,029
F. Raikes, Bridgend	1,006
R. Jones, junr., Bridgend	943

Road Diversion at Southerndown

W. A. Jones, Bridgend	£712
W. & J. R. Watson, Bridgend	671
W. Hopkins, Bridgend	604
D. J. Davies, Bridgend	548
T. D. Evans, Bridgend	546
R. Jones, junr., Bridgend	500
F. Raikes, Bridgend	498
D. Llewellyn, Bridgend	484
G. Jones, Bridgend	419

ROCHDALE.—Accepted for making up a street, for the corporation.—Mr. S. S. Platt, borough surveyor :—

R. Lomax, Eccles.

SHARDLOW.—For the supply of slag, tar-macadam, Leicester granite, ironstone slag, and limestone, for the rural district council.—Mr. J. S. Wooddisse, surveyor :—

Granite.—Dosthill Granite Company, Limited, Tamworth; Cliffe Hill Granite Company, Limited, Leicester; Ellis & Everard, Leicester; Mountsorrel Granite Company, Limited, Loughborough.

Tar-macadam and Slag.—Stanton Ironworks Company, Limited, Nottingham.

WANDSWORTH.—For making up Luttrell-avenue, Putney, for the borough council. Mr. P. Dodd, borough engineer :—

T. Adams, £1,130

WOODBRIDGE.—Accepted for the supply of granite or basalt broken to pass through a 2½-in. and to be rejected by a 1½-in. gauge, whole chalk flint, Washmill flint, Kentish rag, and other road material, for the rural district council.—Mr. George Cook, district surveyor :—

C. W. Parker, Bradwell-on-Sea, Essex.
E. Watkins, Ipswich.
C. R. Ayton, Wymondham, Norfolk.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MARCH.

13.—Institution of Municipal and County Engineers: Eastern District Meeting, 92 Victoria-street, S.W. 4 p.m.

18. Concrete Institute.—Mr. Osborn Hills, F.R.I.B.A., District Surveyor for Strand, on "The London Building Acts, with Some Suggested Amendments."

18.—Mr. E. B. B. Newton, Borough Engineer of Paddington, on "The Use, Abuse, and Misuse of Roads." Municipal and County Club, 8.30 p.m.

27.—Institution of Municipal and County Engineers: South Wales District Meeting at Cardiff.

MAY.

28.—Royal Sanitary Institute: Meeting at Shrewsbury. Discussion on "The Value of Mechanical Filters in the Purification of Water."

TENDERS WANTED.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

THE URBAN DISTRICT COUNCIL OF EAST GRINSTEAD

TENDERS.

The above Council invite Tenders for the supply and delivery at Road Metal Depôts :—

500 tons Tarred Slag Macadam.
[illegible] tons Tarred Slag Chippings.
350 cubic yards 1-in. Granite.
150 cubic yards 1-in. Granite Chippings.
200 cubic yards 2-in. Kentish Ragstone.
150 cubic yards Hand-broken Sussex Flints (Broken).
100 cubic yards Clean Brick Rubble.

To be delivered carriage paid to East Grinstead or Kingscote Railway Stations (L.B. and S.C.R.).

Also for Steam Rolling for the year ending March 31st, 1916.

Forms of Tender and all other particulars may be obtained from Mr. W. E. Woollan, Engineer and Surveyor to the Council, U.D. Council Offices, East Grinstead, to whom all Tenders and Samples must be delivered on or before the 27th instant.

The lowest Tender will not necessarily be accepted.

(By order)
E. P. WHITLEY HUGHES,
Clerk to the Council.

Dated this 8th day of March, 1915. (2,449)

KENT COUNTY COUNCIL.

The Bridges and Roads Committee invite Tenders for the supply of

Shovels,
Forks,
Scavenging Brooms,
Scoops,
Scrapers,
Cart Grease,
Tallow,
Oil,

and other Tools and Materials.

Particulars and Forms of Tender may be obtained on application to the County Surveyor, St. Peter's-road, Maidstone.

Sealed Tenders, endorsed "Tenders for Tools," are to be sent to me on or before Twelve o'clock noon on Saturday, the 27th March, 1915.

The lowest or any Tender not necessarily accepted.

W. B. PROSSER,
Clerk to the County Council.

Sessions House,
Maidstone.
March 10, 1915. (2,456)

ILKESTON CORPORATION.

The General Works Committee, acting on behalf of the Ilkeston Corporation, invite Tenders for the following Materials :—

2,000 tons Tar-macadam.
350 ,, Broken Granite.
1,500 ,, Furnace Slag.
100 ,, Granite Setts.
500 yds. Kerbs.

Full particulars, Specification and Forms of Tender may be obtained upon application to the undersigned on and after Thursday, the 11th inst.

Sealed Tenders, endorsed "Tenders for Road Material," to be delivered to the Town Clerk, Sidney F. James, Esq., on or before noon, Monday, the 22nd inst.

The Committee do not bind themselves to accept the lowest or any Tender.

HENRY JAS. KILFORD,
Town Hall. Borough Surveyor.
March 8, 1915. (2,454)

COUNTY BOROUGH OF ROTHERHAM

ANNUAL CONTRACTS, 1915-1916.

The Rotherham Corporation are prepared to receive Tenders for the supply and delivery of the undermentioned Materials as may from time to time be ordered during the year ending March 31, 1916—viz. :—

1. Broken Granite.
2. Broken Slag.
3. Tarred Slag.
4. Tarred Limestone.
5. Concrete Flags.
6. Portland Cement.
7. Timber.
8. Pitch and Creosote Oil.
9. Gritstone Setts and Kerbs.
10. Granite Setts.
11. Cast-iron Pipes.

Specifications and Forms of Tender may be obtained, on application, from the Borough Engineer's Office, Town Hall, Rotherham.

Sealed Tenders, endorsed "Tender for ——," must be delivered at my office not later than Saturday, March 27, 1915.

THOS. J. [illegible]
(2,452) Town Clerk.

TRING URBAN DISTRICT COUNCIL.

TENDERS FOR MATERIALS.

The Council invites Tenders for the supply and delivery of Broken Granite, Chippings, Flints, and Hoggin as and when required for the year ending 31st March, 1916.

Full particulars and Forms of Tender may be obtained on application to the undersigned.

Sealed Tenders, endorsed "Tender for Materials," and accompanied by samples, must be delivered to me not later than noon on Saturday, the 20th March, 1915.

The lowest or any Tender will not necessarily be accepted.

S. S. GETTINGS, Assoc. M. Inst. C.E.,
Surveyor.

Surveyor's Office,
Tring.
March 9, 1915. (2,454)

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. MARCH 19, 1915. No. 1,209.

Minutes of Proceedings.

Electrolysis of Pipes.

One of the earliest methods of preventing electrolysis of underground pipes was the adoption of a coating of some non-conducting material. In order to test the value of this insulation the American Bureau of Standards carried out certain investigations some time ago and tested various coatings, including pitch, asphalt, pitch and paper wrapping, and asphalt and felt wrapping. It was then found that the average life of the paint was 113 days, the wrapping lasted longer than the paint, and the best of the wrappings lasted much beyond 300 days. It was pointed out that the failure of the coatings was due to the fact that they absorbed water, and that this in time penetrated to the iron and allowed an electric current to flow and destroy the coating by electrolysis. After the first appearance of the current flow the destruction of the coating was rapid. It is therefore to be concluded that the protection against electrolysis which is afforded by such surface insulation is only temporary, a conclusion which is also supported by general experience with coated pipes buried in the ground and subjected to the action of strong currents of electricity. Painting or otherwise coating iron with an alkali-resisting metal preservative before embedding it in concrete may serve to minimise the danger of electrolysis, but no such coating has been found that does not prevent the formation of the bond between the concrete and iron when the concrete sets. Thus all circuits within a building should be kept free from earths directly on a portion of the building itself. If the supply comes from central stations the local circuits should be periodically disconnected and tested for earths and incipient defects in the insulation. All pipe lines entering concrete buildings should, if possible, be provided with insulating joints outside the buildings. If a pipe line passes through a building and continues beyond, one or more insulating joints should be placed on both sides of the building. If the potential drop around the insulated section is 5 volts, or 10 volts, or more, the insulated portion should be shunted by means of a copper cable. The grounding of electric currents to water pipes and ground plates is in general not to be recommended in the case of concrete structures. The United States Bureau of Standards has found insulating joints of great value in reducing the current in pipe lines, and so reducing the corrosion caused by such current. These insulating joints should not be relied upon as the sole means of protection, but they are an important auxiliary means of protection. It cannot be said, however, that the problem has yet been solved. The co-operation of water and gas engineers with the engineers of electrical companies is therefore to be desired, in order that everything may be done to find the subject with an open mind and to mitigate the nuisance as far as may be possible.

* * *

Seaside Improvements.

In another column will be found a special article on "Seaside Improvements," from the pen of a contributor who speaks with knowledge on this important subject. The modern seaside resort must be run on business lines if it is to succeed; and local authorities are coming to recognise more and more that the expenditure of large sums of money in suitable directions may be more than justified in the return, both direct and indirect, produced. The keenness of the competition for patronage between the various resorts is evidenced by the increase in the practice of advertising attractions in various ways. The mere issue of advertisements, however, will never produce the desired result, unless they are reinforced by the personal satisfaction and recommendation of the visitors themselves. The hand of the municipal engineer is seen in almost every form of attraction. Parks and open spaces, golf courses, bathing pavilions, open-air baths, piers, and marine lakes alike come within his province; while the housing of the band or orchestra upon which, by the way, Bournemouth spends no less than £10,000 a year, as we see by our contributor, calls particular attention to the changes which are taking place in regard to the provision of bathing facilities. The day of the bathing machine is past, and few, save the antiquarian, will be found to regret it. Not only so, but there is also a growing tendency to substitute the artificial open-air bathing pool for the dip in the open sea. Many works of this kind have been projected and are now under construction. Another modern attraction in places where large tracts of sandy foreshore are left uncovered except at high tide, is the provision of a marine lake where safe boating may be enjoyed at all times. The most notable work of this kind is to be found at Southport, where the lake has an area of 45 acres, and, besides allowing boating and yachting, has a portion fenced off for a water chute and children's paddling pool. In spite of these new forms of attraction, however, piers and pavilions fully retain their popularity, and many towns are contemplating new works or improvements in this direction. In particular, we may mention the competition in which the Brighton Corporation offer substantial premiums for designs for rebuilding the famous Aquarium. One effect of the war, no doubt, will be to increase the popularity of our home holiday resorts, and the more far-seeing authorities are already spreading their nets to catch their share of the new patrons.

An Attractive Appointment.

The St. Germans Rural District Council, being desirous of securing the services of a whole-time officer as their surveyor, have exercised their ingenuity in drawing up the following list of conditions for the appointment:

ST. GERMANS RURAL DISTRICT COUNCIL.

SURVEYOR.

The surveyor shall be a whole-time officer, and shall do no other work outside the council.

He must carry out his duties personally, and not by an assistant.

He must reside within the St. Germans district area, in a place approved by the council.

He shall not be a shareholder or have any interest in any quarries, contractors, tradesmen, or others doing business with the council.

The surveyor must provide his own horse, cycle, or other means of travelling at his own expense. Also his own office.

He will be required to keep all the usual books and accounts to the satisfaction of the district auditor, before whom he must bring them at the usual half-yearly audits.

He must attend the monthly meetings and committee meetings of the council, report things to them, and also bring the parish wages books to the meeting.

He must place before the Finance Committee, monthly, all bills and accounts initialled by him, which he shall have satisfied himself are correct; also his estimates for the ensuing month.

He must prepare plans and specifications for any contracts required, and see that the contracts, in all cases, are properly carried out.

All quarries are to be worked in a satisfactory manner, and the *surveyor* is to measure all stones, and see that they are of the quality required.

Notice to be given to by the surveyor to the councillors of the parish when stones are measured.

The usual notices under the Quarries Act to be kept posted in all quarries worked by the council.

The surveyor to visit all roads as often as possible, and see that the roads are in order, drains and water tables clean, hedges trimmed, and bridges in good repair.

The surveyor, as far as possible, to look after all the men who are employed by the council, and see that they work their proper number of hours and do their work in a satisfactory manner; in any case where the surveyor finds a man is not doing so he may put him to do piece or contract work at the usual prices paid by the council.

All men to be paid once every fortnight, and arrangements to be made to pay the men without their wasting time in going to the office.

The surveyor must prevent any person from breaking up the roads for any purpose without them having first received his permission to do so.

The surveyor is to furnish the bond of a guarantee society or company for £200.

Salary £120 a year, payable monthly. Surveyor to give or receive three months' notice to terminate the office.

No personal canvassing will be allowed. Candidates chosen to appear before the council will be allowed third class railway fare.

We will refrain from any merely literary criticism of this document, and content ourselves with calling attention to some of the more startling requirements of this attractive appointment. In the first place it will be noted, the new surveyor is to be a whole-time officer, although the salary is only £120 per annum, and in spite of the fact that his predecessor, with a salary half as large again, was permitted to engage in private practice. The next stipulation—that he must carry out his duties personally, and not by an assistant—means not only that the surveyor will have no holidays, but it also renders the adequate supervision of upwards of 250 miles of roads (which the district contains) a sheer impossibility. It will also be observed that out of his modest pittance the surveyor has to provide his own office and his own "horse, cycle, or other means of travelling." As a matter of fact experience has shown that a cycle, horse and trap and even a motor cycle are inadequate, and a small car has been found necessary, leaving, it will be conceded, very little margin out of the salary offered. In addition to attending council and committee meetings, the surveyor has thrown upon him the rather vague duty of reporting "things" to them. He has to measure all stones, but before doing so he must "give notice to the councillors of the parish." We have examined the conditions attaching to many appointments of this kind, but we do not remember ever having seen this one before; and we can hardly imagine that any self-respecting surveyor will be found to tolerate such an arrangement. Another condition which gives some idea of the consideration with which the surveyor may expect to be treated is the one which says that arrangements must be made to pay the men without their wasting time in going to the office. Nothing is said about wasting the time of the surveyor, presumably because the whole of that commodity is to be at the disposal of the council. We understand that in due course three candidates were selected for interview. One was an ex-pupil of the former surveyor, another was a village carpenter, while the third was a gentleman known in his own locality as the "tramp surveyor." The last-mentioned did not attend, and the appointment was postponed pending his appearance. It may be that he, at any rate, can supervise 250 miles of roads without either horse, cycle, or any means of travelling other than shanks' pony!

Willington Urban Council and the House Owners.

Back-to-back houses have very few defenders, but it is doubtful whether, in the abstract, they may not possess some meritorious aspects if they become the subject of such courtesies and expressions of goodwill from landlords towards the municipal authorities as were reported recently at the meeting of the Willington Urban District Council. The surveyor, Mr. J. H. Gardner, stated that representatives of the owners of back to back houses attended a Works Committee meeting, at which it was recommended that the council should give an assurance to the county council that all such property within the council's area would be converted into through houses, or otherwise so altered and improved that proper through ventilation was provided to put them in a sanitary condition within the next five years. The result of the meeting appears to have been quite satisfactory, for the council received subsequently a communication in which the owners undertook cheerfully to carry out the council's requirements within the term stipulated, and expressed the hope "that the plans submitted would receive the usual courtesy and fair-minded consideration for which the Willington Urban District Council is so justly noted." That this praiseworthy expectation did not remain unfulfilled is proved by the receipt of a final communication from the landlords tendering to the council and Dr. Hill, county medical officer of health, their sincere thanks "for the splendid fairness and courtesy with which our deputation was received and treated."

This is a well-directed quite a new spirit in which to meet the municipal authority, and that it has been evoked by back-to-back houses argues hopefully for its eventual extension to, say, schemes of sewerage, sewage disposal, and private street works. Municipal bodies in regard to these matters have hitherto been smitten not only upon one, but both cheeks. The Willington Urban District Council, despite its past reputation for fair-mindedness, will doubtless treasure as a cherished possession a testimonial which falls to the lot of few authorities whose duty it is to administer the laws of public health.

Organisation of Labour. The Committee of Imperial Defence have been considering the question of mobilising the labour forces of the country with a view to meeting the enormous demand for labour, not only for the manufacture of the munitions of war but also for the production and transport of the food supplies for the civil population. One of the sources to which they are looking for the necessary additional workers for these purposes is the labour employed by the municipalities and other local authorities. To this end two circulars have recently been issued one by the Local Government Board and one by the Road Board. The request of the former authority is that as far as possible male labour of high physical quality should be released for national purposes, and that men of more advanced years or where practicable, women workers should be substituted. The circular appears to be of quite a general character, so that, although the local authorities may be anxious to do all they can in the matter, difficulties will undoubtedly arise unless some machinery is set up for securing the transfer of the released labour to the desired places. The Road Board circular has been sent to the county surveyors of England, to certain county surveyors of Wales, and to most of the county and metropolitan boroughs, and is of a more specific character. The board state that they are engaged in arranging with various highway authorities for road work required in connection with military traffic, and that, owing to shortage of labour, progress is slower than it ought to be. They then ask for the temporary service of good workmen, who would receive, in addition to their pay, lutting accommodation, with blankets and rugs. Further, railway fares would be paid to the scene of operations and also return fares to those who return to their present employment. We feel that it is unnecessary for us to urge local authorities to respond to these appeals, feeling sure that their patriotic spirit will lead them to do so, even at the cost of considerable local inconvenience.

War Bonuses. Many local authorities have found themselves compelled to take into consideration the question of granting to certain of their employees of the lower grades some temporary increase of pay so as to help them to meet the increase in the cost of living which has taken place since the outbreak of war. The line has in many cases been drawn at those officers and servants who are in receipt of a wage of less than thirty shillings a week. The matter was before the London County Council at their last meeting, when a comprehensive report was presented by the General Purposes Committee, who recommended that certain increases should be granted in the first place for a limited period of three months. They further recommended that no discrimination should be made against those officers and servants who are on active service. The latter recommendation appears to us to be eminently reasonable, although we understand that some local authorities have not extended the grant to such cases. Moreover it has been contended that additional pay should only be given to those employees who are married, or have dependents. In our view this course is illogical, unless similar distinctions are to be made in fixing rates of wages at ordinary times. The question is, What is a fair price for labour in the prevailing circumstances. It appears to us to savour of the inquisitorial if local authorities, in fixing rates of wages, are to inquire how they are to be spent, or what are the domestic responsibilities of the recipients. Another discrimination which ought not to be made is that between junior officials and workmen. The former, with appearances to keep up, are at least as hardly hit as the latter by the general rise in prices.

Heavy Motors and Roads. In our issue of last week we were able to announce that in view of the complaints which have been made as to the alleged excessive damage caused to roads by certain classes of heavy motors and locomotives, Mr. Herbert Samuel, the President of the Local Government Board, has appointed a small expert committee to inquire into the sufficiency of the existing requirements with respect to the construction of these vehicles, including weights on wheels, widths of tyres, diameters of wheels, and so forth. The terms of reference are very wide, the committee being asked "to consider the law and regulations relating to the construction and use of road locomotives and heavy motor cars in Great Britain, and to report what amendments, if any, are desirable." The committee is a strong one, and its personnel is such as to command complete confidence, municipal engineers being well represented in the persons of Mr. E. J. Lovegrove, the borough surveyor of Hornsey, and Mr. J. Willmot, the county surveyor of Warwickshire; while Mr. P. M. Crosthwaite, one of the engineering inspectors of the Local Government Board, also has a place. Among the questions raised by the use of roads by heavy motor traffic is that of contributions by the owners of motor omnibuses towards the cost of road maintenance. It is understood that a joint Select Committee is to be appointed for the purpose of dealing with this particular aspect of the case.

District Meetings. Last week we gave publicity to the arrangements made in connection with the South Wales District meeting of the Institution of Municipal and County Engineers which is to be held on Saturday, the 27th inst., at Cardiff, and in the present issue we reproduce the programme of a South-Western District meeting which will take place on the same afternoon at Taunton. Not for the first time does it happen that two of these gatherings are fixed for the same day, and we cannot help thinking that the arrangement is, to say the least, a somewhat undesirable one from the point of view of members generally. Where the meetings happen to be in widely separated districts there can be little or no objection to the clashing of dates, but when, as in the present instance, they are held in localities which are fairly accessible to numerous members of other districts, there can be no doubt that the attendance at one or both of the gatherings must be affected in some degree. The point is one that seems to deserve the attention of district secretaries.

Pay with the Colours. We are quite in accord with Mr. Montagu, Parliamentary Secretary to the Treasury, in the plea he made recently in the House of Commons that civil servants with the Colours should not receive less than the total sum they were entitled to receive in civil work, to ensure this a proportion of their ordinary salaries being allowed when necessary to supplement their Army pay. Local government officials are to all intents and purposes civil servants, and we have frequently urged that this principle should be applied to them. If it had, it is conceivable that Notts County would not have lost an engineering official whose reputation as a road-engineering expert extended beyond the boundaries of this country. It is surely time that local authorities adopted, as an absolute minimum, the policy enunciated by Mr. Montagu.

Seaside Improvements.

THE ACTIVITIES OF MUNICIPAL AUTHORITIES.

Specially Contributed to The Surveyor.

The increasing prosperity of all classes, coupled with the improved travelling facilities by rail and road, makes it necessary for those seaside authorities who wish to attract the holiday public to bestir themselves and put their house in order to receive their paying guests. The struggle for existence is very keen, and it is a case of the survival of the fittest with communities equally as with the individual. Many local authorities do not make the most of their natural advantages, or, where these are lacking, realise the need for assisting Nature by providing other attractions. In many cases it is owing to undue modesty; in others it is due to a policy of masterly inactivity which aims at keeping low rates, though not the stagnation which inevitably follows. On the other hand, we find many towns with few natural advantages who, by judicious enterprise and expert window dressing, go ahead by leaps and bounds. The bold advertiser who has studied the weaknesses of his fellows considers modesty a blunder—if not worse—and therefore trumpets as loudly as possible the praises of his town, with the certain knowledge that a large part of the world will take him at his own valuation. The advertising agent and director of entertainments in our seaside resorts are powers in the land, and with the large funds now placed at their disposal by their councils they are likely to become even more powerful. Still, they must be backed by something more tangible than advertising, and it is to the work of the municipal engineer or architect that many towns owe so much of their popularity. Apart from a good water supply and good sanitation and lighting, the provision of piers, promenades, parks, gardens, lawns, tennis courts, concert halls, bandstands, bathing pools and pavilions, marine lakes, shelters, and similar attractions all fall to the lot of the engineer or architect to design. On the style on which these works are designed, and the manner in which they are constructed, a town's attractiveness greatly depends. The spending of large sums does not necessarily ensure satisfactory results from an artistic point of view. Ostentation and vulgarity are frequently found in the plutocrat, and the character of our governing bodies can often be judged by their municipal works. The engineer of the large town must necessarily be a good organiser, but he is not so necessarily a man of good taste. The engineer in the small town is frequently no better in either direction; but still, we often find in some little-known town or district municipal work carried out not only with great technical ability, but with the most praiseworthy regard for its artistic possibilities.

The sociological side of seaside development cannot be ignored by any municipal authority in its efforts to cater for the public. We find the things which succeed in one place are an utter failure in another. While some towns lay themselves out to cater for the tripper, others taboo him to the extent of memorialising the railway companies to stop all day trips. Again, caste rules so largely in some places that the outsider who presumes to pitch his tent in their midst is treated as an interloper and sent to Coventry, and he may be lucky if he think he has got into a community of anchorites. A few miles away another town so fully recognises the gregarious disposition of its visitors that it welcomes all and sundry without standing on the ceremony of an introduction.

Towns so very similar as Blackpool and Douglas differ entirely in their estimate as to the value of piers, for while Blackpool has three, Douglas does not, apparently, feel the need of one. Brighton finds two none too many, but Ostend can hardly be said to have one, for the Estacade, while providing a promenade some 600 yds. to sea, is simply a primitive wooden structure affording nothing in the way of the entertainments found on nearly all English piers.

Again, while towns like Bournemouth and Southport spend immense sums on the maintenance of town bands—Bournemouth spends £10,000 a year—and make large profits out of doing so, Blackpool provides no public band, though very fine orchestral bands are to be found on the piers and in the entertainment palaces. There are, moreover, a large number of places where bandstands have been erected at a large cost, which utterly fail to attract anything like adequate support.

Most places find a park or gardens a great attraction, and one would think that those towns which did not provide them could not expect such popularity as those places which have, at very great expense, laid out beautiful parks and gardens. Yet we find two very keen rivals on opposite sides of the Ribble Estuary, one with fine parks and the other with none, and the town without a park undoubtedly attracts a far larger number of visitors.

Golf, again, appeals to a very large class of holiday makers in the present day, and places like Cromer, Sandwich, Lytham, St. Annes and Hoylake all owe much of their popularity to their excellent golf courses.

Open-air bathing is almost universally popular, but the facilities for indulging in this healthy recreation are very varied in different parts of the country. The old bathing machine—the box on wheels—is, along with the hideous bathing dress imposed by Mrs. Grundy on our grandmothers, doomed to soon disappear. If the Germans in their raids on Scarborough and Yarmouth should capture these specimens of "frightfulness," we should not begrudge them their booty, and there really appears to be very good grounds for thinking they would make a strong appeal to their "kultur" and "interest" in "art" tastes.

BATHING PAVILIONS AND OPEN-AIR SWIMMING BATHS.

The more modern dressing pavilion, with hot and cold water spray or foot baths, promises to supplant other forms of dressing-boxes. The large bathing pavilions at Margate, at Palm Bay, and more especially at Westbrook, are great improvements in every way. The new dressing pavilion at Westbrook is a substantially built concrete structure, which was erected last year at a cost of £6,000. It provides dressing accommodation for sixty persons of each sex, and contains a large cafe, which brings in a very substantial rent. Even the canvas bathing tent promises to be superseded in many districts, as in wet or rough weather it is by no means an ideal shelter or provides the privacy that could be desired.

Probably in no direction is so great a change likely to take place as in the provision of bathing facilities. A few years ago only a few open-air bathing pools were to be found at our seaside resorts, and those, such as Margate, Morecambe, and Scarborough, were of primitive description. During the past year or two a large number of up-to-date bathing pools have either been constructed or projected, and a few remarks with regard to these pools will be of interest to many municipal engineers.

Southport last year constructed an open-air bathing pool, which is probably the largest in the Kingdom. It is 400 ft. long, 200 ft. broad, and varies in depth from 18 in. at the sides to 6 ft. 6 in. in the middle. Although the pool is filled at high water, and, like most other holiday places, it was badly hit by the war, it has been a great success, and 1,000 persons have paid for admission to the bathing enclosure in a single day. Over 2,000 visitors, and a total of 20,000 in a month.

At Scarborough, despite the bombardment by the Huns, a very fine open-air bath, with dressing pavilions, bungalows, and café, is being constructed at the South Bay at a cost of £13,200. The bathing pool is oval in shape on the sea side, with a flat side to the cliff, and its length is 350 ft. by 190 ft., with an average depth of 2 ft. 7 in. The bathing pavilion is on the cliff, and contains seventy-six dressing-boxes, [illegible] modation at each end for schools. Above the boxes a large café is to be constructed, and behind, in terraces, a block of nineteen bungalows is to be erected, and a laundry block will be provided. The council are so convinced of the attractiveness of this form of bathing that they have recently decided to construct a somewhat similar bathing pool at the North Bay at a cost of £10,000.

Smaller open-air bathing pools have also been constructed at Hoylake and Southend. The Hoylake bathing pool is 129 ft. long by 100 ft. broad, and has

a depth of 3 ft. at the deep side and 6 ft. at the other. A smaller pool for children 100 ft. by 40 ft. is also to be constructed this year. There are to be dressing rooms for ladies and gentlemen, and refreshment rooms and tea-houses have been provided. The bathing pool is popular that the dressing and bathing accommodation will have to be greatly increased, and is likely to be extended in the near future.

At Southend a new open-air bath, 400 ft. long by 200 ft. wide, is to be constructed and opened at a cost of £5,000 and has been fixed by Mr. Lidell, the borough engineer, at the joint head levels of the Institution of Municipal and County Engineers, which is published in THE SURVEYOR of June 12, 1914. The depth of water will vary from 2 ft. 6 in. to 8 ft., with a diving pool 8 ft. 6 in. deep. Dressing and bathing accommodation for [illegible] bath, & c., is to be provided.

At Lytham the council have approved plans for a bathing pool, 350 ft. long by 120 ft. wide, with depths varying from 15 in. to 6 ft. 6 in., with a diving pool at one end 7 ft. deep. Dressing [illegible] each for ladies and gentlemen are provided, with ten larger boxes for parties and schools. The scheme also provides for twenty bungalows, ladies' and gentlemen's swimming club rooms and cafe, and, together with the promenade work, to [illegible] £10,000.

At St. Annes an open-air bath [illegible] constructed at a cost of £5,000. The bath [illegible] long, 120 ft. wide, and vary in depth from 7 ft. to nothing. A cafe, fifty-four dressing-boxes with roof promenade and [illegible] are to be provided.

The Blackpool Corporation propose to construct an open-air bathing pool on the foreshore of the same size as that at Southport—400 ft. long by 200 ft. wide.

At Fleetwood the urban council have [illegible] enclose 16 acres of the foreshore, which they are to develop by constructing an open-air bath, 330 ft. long by 200 ft. wide, with depths varying from 6 in. to 7 ft., with tennis courts, bowling greens, and recreation ground at an estimated cost of £20,000.

There are several interesting engineering problems in connection with these open-air bathing pools which call for the designer's careful consideration. The most obvious is the one dealing with the level of the pool, for, while we find at Southport, Southend and Lytham that the pools will be filled at high water by the tide, at Hoylake and St. Annes it is proposed to pump the water into the pool. Nearly all will empty the bath by gravitation, but a small quantity at Southend is to be pumped to sea. Again, it is not considered necessary to filter the water at Southport or Hoylake, though, with the very sandy foreshore at both these places, much sand is sure to be carried into the bath, and the water cannot be so clean as at Southend. Lytham and St. Annes, we [illegible] to be adopted. At Southport and Lytham the floor of the bath is only concreted for a few yards from the sides of the bath, as the sand is sufficiently close to retain the water; but at Southend and Hoylake the bottom of the bath is concreted.

MARINE LAKES.

Among other outdoor attractions which several municipal authorities have provided, or are about to provide, are marine lakes. Where there are large expanses of foreshore which are only covered at high water, the need of a lake for safe boating at all states of the tide is very urgent.

At Southport, as is well known, the sea has receded so far from the promenade that a tramway is laid to the end of the pier to enable visitors to get a glimpse of the sea. The corporation have, however, not only refused to accept quietly these unkindly rebuffs of Nature, but by their enterprise and the skill of their engineers they have transformed this sandy waste into beautifully laid-out gardens and lawns, and constructed a large lake which does much to console visitors for the absence of the sea. The lake has an area of 15 acres, and besides allowing boating and yachting, has a portion fenced off for a water chute and children's paddling pool. The approximate number of persons using the lake last year was 373,000, and a revenue of £4,646 was obtained.

The marine lake at West Kirby is 33 acres, nearly ½ mile long, and is largely used by boats and yachts. About £500 is taken, half of which is paid by the boat contractor to the council for the use of the lake.

A marine lake is to be constructed at Lytham, and it is intended to enclose about 25 acres of the foreshore for this and the open-air bathing pool. The [illegible] Lytham to [illegible] £2,500.

Other places [illegible] marine lakes are to be found are Cleethorpes and Rhyl, and one is also proposed at St. Annes-on-the-Sea.

[illegible]

[illegible] the provision of pier pavilions that most enterprise is shown by local authorities, for a large number of piers or concert halls on the sea front are owned by municipal authorities. Among the municipalities that have recently [illegible] the corporation have decided to erect a band and concert pavilion at a cost of £20,000. The Bournemouth Town Council have recently received the sanction of the Local Government Board to provide a pavilion [illegible] at a cost of £60,000.

Brighton Corporation have decided to offer 175 guineas for a competition for the rebuilding of the Aquarium, with a concert hall to hold 1,200 persons, [illegible] and garden terraces, at a cost of £22,000. This well-known building has had a rather chequered career, and it is to be hoped that the new building will be more successful than the existing building, and more worthy of the fine site on which it will stand. Private enterprise is also going to effect a great improvement in our leading watering-place. A covered bandstand and concert hall are to be erected on the West Pier, and the Palace Pier is to be widened from 60 ft. to [illegible] and [illegible] to accommodate 4,000 persons, and an outdoor restaurant are to be erected on the widened pier. The estimated cost of the improvements on the two piers is about £40,000.

At Southend the main deck and upper deck of the pier is to be increased by 1,800 sq. yds. On the upper deck there is to be constructed a large café, the roof of which will form a promenade at a higher level. These proposed works, which are to cost £20,000, are [illegible] THE SURVEYOR of June 12, 1914.

Yarmouth is to spend £24,640 on a swimming bath, lawn, and sea-shore improvements, and marine parade extensions. Burnham Urban District Council is to spend £10,000 on a new pier. Skegness are going to build a garden pavilion on the foreshore with a frontage of 107 ft., a café on the ground floor 41 ft. by 18 ft., and a roof-garden café 80 ft. by 30 ft.

At Aberystwyth a new pier, with a pavilion at the land end and a landing-stage at the other end, is to cost £25,000.

Lytham Urban District Council are proposing to convert their Assembly Rooms into an up-to-date large concert hall, the scheme also including the provision of new indoor baths and new council offices. St. Annes are proposing to erect a concert pavilion in the newly acquired site for gardens which Lord Ashton so generously provided for them.

This list is by no means exhaustive either of the number of towns or the class of work in which municipal and private enterprise has been active in seaside resorts during the past year. It is, however, sufficiently complete to show that we are not likely to be left behind in the competition with Continental nations for the patronage of the holiday seeker. So far as sanitation goes we have long held the foremost place, but it is only recently that we have awakened to the great attraction of outdoor life and amusements. Our uncertain climate has had a great deal to answer for this, but the very general adoption of open-air cafés in our seaside towns, not to mention those in our inland health resorts and the parks in our large towns, shows that we are now overcoming any objections or difficulties experienced in this direction. Indoor entertainment is also necessary, and one of the most striking features of our public life is the eagerness with which our municipal authorities now either supplement or supply the recreations which private enterprise neglects to provide. The war on the Continent is bound to keep many of our people at home for some time, and those who stay here can certainly look forward to being entertained in the very best and most attractive manner.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier.*

The Treatment of Waste Waters from Tin and Lead Mines, Gut Factories, and Piggeries.—(VII.)

By G. BERTRAM KERSHAW, M.AM.SOC.C.E., M.INST.C.E., Late Engineer to the Royal Commission on Sewage Disposal.

Tin mining is now almost confined to the county of Cornwall, while lead is now chiefly worked in Wales, Cumberland, and the mountain limestone district of Derbyshire.

Taking tin mining first. The tin is obtained from cassiterite or tinstone, the mineral being got by sinking shafts and mining operations. It is worthy of note that the tin lodes in Cornwall run east and west, tin being usually met with in close proximity to, or mixed with, copper ore, together with arsenical pyrites, bismuth, mundic, and so forth. To get the tin the ore is passed through stamps and crushed, the pulverised material being carried by a stream of water over specially constructed tables, in order to separate the heavy tin from the other matter. The water which carries off the dirty waste material, and also a certain proportion of tin, is termed "tailing water," and is usually discharged into the most convenient river or stream; but occasionally the water is re-used.

These tailing waters contain very large quantities of suspended matter sometimes as much as 2,000 parts per 100,000; the solids in solution, however, are usually small. The bulk of the suspended matter settles fairly readily, but it must be remembered that a very large quantity of solid material has to be dealt with in the aggregate, even in the case of a small mine.

The Rivers Pollution Commission of 1868, dealing with the question of tailing waters from tin mines (Fifth Report), say: "Among the numerous samples there is not one which even approaches the transgression of any of our proposed standards relating to dissolved matters; indeed, in most cases, mere subsidence leaves the supernatant water much purer than the average potable water supplied to towns, the only objectionable constituent in solution being arsenic, which is present, however, in but very small proportion. On the other hand, these waters grievously pollute and silt up the rivers into which they flow by the suspended matter contained in them. Each 1,000,000 gallons of water issuing from the Dolcoath mine, for instance, carries with it more than 80 tons of suspended rubbish, 200 lb. of which are metallic arsenic—equivalent to 264 lb. of white arsenic. Nearly the whole of this suspended matter is easily deposited when the water is quiescent. None of the samples contained copper in solution, or exhibited any marked acidity."

The "Red" river, in Cornwall—so called from the colour of its water and bed—may be mentioned as a river which has received tailing waters from numerous tin mines for generations, and in this particular case, together with many other similar small rivers and streams of the same type, it would appear difficult to say to whose advantage it would be that the waste mine waters should undergo treatment before discharge. Certainly in the case of the tin-mining industry it might possibly be profitable to settle out the [illegible] to waste in the tailing waters; or, if not actually profitable, the tin recovered might cover the cost of settlement. Selective settlement, or the adjustment of velocities through the tanks so as to deposit materials of different specific gravity in separate compartments, would no doubt be well worth attention.

LEAD MINING.

Lead [illegible] as formerly, but there are still mines which are profitably worked in different parts of the country; for example, the Weardale mines and the Threlkeld mine near Keswick. Lead ore is termed galena, and it is often associated with silver, zinc, copper, &c.

The process to which the ore is subjected in order to recover the lead from the worthless rock is, to all intents and purposes, similar to that employed in tin mining.

The tailing waters resemble somewhat closely those derived from tin mines, and they contain large quantities of [illegible] suspended matter, further they are [illegible] lead and arsenic, but the [illegible] appear to have been very fully investigated so far, and the main apparent damage caused by lead mines appears to be the injury caused by the silt being washed from the river bed on to adjoining pasture land during floods.

With reference to the question of damage to cattle, the 1868 Commission observed: "We are bound to add that, excepting the destruction of ducks and other poultry reported to us at mines near Hexham, on the north side of the river Tyne, where large quantities of carbonate of baryta are obtained (to the deposit of which in the roadways and river channels, no doubt, this fatality is due), no complaints from stock-owners in the neighbourhood of lead mines in the North of England have been made to us. The valleys are wider, and there is ample space for storage of waste materials around these mines in Allendale, Teesdale and Weardale, and the moorland which may be occasionally overflowed by the muddy waters is of little value."

Settlement of tailing waters has been found to be practicable at several lead mines, and good results have been obtained, the settled waters containing very little suspended matter, and, where there is sufficient area available, lying at a suitable level, which can be embanked to form settling ponds, such a method of treatment can be economically carried out. Where, however, settling tanks or ponds had to be constructed of building materials, the cost would be very heavy by reason of the large volume of tailing water produced—often considerably in excess of 200,000 gallons per twenty-four hours.

A source of trouble which not infrequently occurs where minerals are got is the ochre water which is often met with, particularly in the case of old disused mines or pits.

Such waters were expressly exempted by the Rivers Pollution Act of 1876, since they came under the heading of mine water "in the same condition as that in which it has been drained or raised from such mine."

In many parts of the country—particularly in Durham the beds of the streams are covered with ochreous matter, while fish life and water weeds alike are absent.

A natural remedy would be the treatment with lime of the acid iron water before its discharge, but this would be extremely costly, and who would be responsible for the cost of treatment in the case of disused mines, where the water has risen up in the workings, and [illegible] the salts?

GUT FACTORIES.

The [illegible] on the preparation [illegible] for sausage skins, gut bands and strings. The bulk of the work is done in the winter months.

The [illegible] guts are soaked for periods of about twelve hours each in galvanised-iron tanks, in two changes of clean water; they are next laid upon boards, and carefully scraped with thin wooden scrapers, all adherent mucous and slime being removed. They are next inflated to detect any small holes or tears, and, if required for [illegible] they are packed [illegible] with salt and dispatched to market.

When gut bands [illegible] are wound, under tension, round rectangular wooden frames and dried. The chief use of this form of gut is for violin strings and for stringing tennis rackets, the butt ends of the guts of Welsh sheep being preferred for the latter purpose. At a fair-sized gut works as many as 2,500 sets may be dressed in a week at a busy season. The waste liquid, which is not large in volume, consists of the contents of the soak tanks when run off, together with the washings from the floors, utensils, &c. It resembles a brownish water, and has a most nauseating, pervading smell. The solid matter scraped from the guts is generally used [illegible] feeding pigs.

At one particular [illegible] are [illegible] holding 450 gallons, and two smaller ones [illegible] 225 gallons, or a total combined capacity of 900

gallon. As these are filled twice in the twenty-four hours, the total volume of waste liquor may be taken to be about 2,000 gallons, inclusive of floor washings. The waste liquors flow into a covered tank filled with clinker. This tank is emptied once a year by means of a chain pump.

The liquid from this tank or filter flows by pipes some little distance to a pit in a grass field, filled in with stones, and here all the liquid is absorbed. About an acre of grass land is available, if required. Pigs are kept on the land, and all scraps from the works are conveyed here and spread over the land for the pigs to eat.

The tank was obviously doing no work on the liquid, and such [illegible] was used [illegible] could not have been expected to have done any. The liquor [illegible] and to have obtained anything like a satisfactory effluent, a very low rate of treatment per cube yard of filtering material would have been [illegible] lieu of dilution before filtration.

By the exercise of [illegible] and underdraining [illegible] reach the drains and mingle with the bulk of the waste liquids, much can be done in reducing the ultimate strength of the liquid to be purified, and there is no difficulty in country districts in disposing of the solid matter by feeding pigs.

Piggeries.

Much difficulty [illegible] waste liquor from piggeries, where large numbers of pigs are kept, since the liquor is [illegible] ten to fifteen times as strong as [illegible] of average sewage.

There are perhaps not many piggeries in this country where [illegible] pigs are kept, as in Ireland, pigsties [illegible] are fairly frequently met with. Moreover, the treatment adopted for the purification of piggery sewage will also answer for the treatment of ordinary farmyard liquid wastes, where [illegible].

As a general rule, piggeries are worked in conjunction with creameries or cheese factories, the by-products being utilised for feeding the pigs.

The sewage from [illegible] urine, with water used for washing down [illegible] In no circumstances should the faeces be permitted to mix with the rest of the sewage; they should be collected and disposed of for manure. This solid manure should be [illegible] sawdust placed on a concrete floor, the whole floor being [illegible] A gutter should surround the floor, leading to a drain, protected by a grid. There is no difficulty in getting rid of the solid manure [illegible] it will [illegible] a valuable manure [illegible].

A certain amount of [illegible] to the drain after the cleaning down of the [illegible] especially during rainfall, but if the solids are regularly removed it will be reduced to a minimum.

About three gallons of [illegible] produced per pig per day, most of it during the day-time, but a rather large amount of water is used for washing down the floors which must be kept scrupulously clean; so that the total dry-weather volume of liquid sewage per pig may amount to 4 to 5 gallons daily, and during rainy days there will be a considerable addition to this quantity.

The degree of purification required will, of course, depend very largely upon the local conditions, and in the majority of cases it is quite possible that a high-class effluent will not be needed. In certain particular cases, however, as, for example, where the effluent enters a small sluggish stream, full treatment will be advisable, if not essential.

Preliminary treatment of such a strong* liquid is best carried out by precipitation with lime in settling tanks, constructed in duplicate, each of them having a capacity equivalent to about 1½ days' flow of sewage.

The tank liquor is best treated on deep percolating filters of medium-sized material, and the filter effluent should be passed through shallow sand-straining filters.

Unless a very low rate of treatment is adopted—say 20 to 25 gallons per cube yard per twenty-four hours—a good effluent cannot, as a rule, be uniformly obtained, and in general it is much better, wherever practicable, to dilute the tank liquor with from two to three times its volume of clean water, and then to filter at a rate of about 75 gallons per cube yard per [illegible]. If [illegible] very much better distribution will be obtained.

It must be remembered that the filter in dry weather will probably only be working for some sixteen to eighteen hours out of the twenty-four, and in order to spread the work given to the filter over [illegible] settling tanks, the tank liquor being drawn off [illegible] chamber and syphon can be used, and intermittent distribution; but this method does not give as good results as the direct feed from floating draw-off arms.

The writer somewhat recently gave evidence in a lawsuit originating in the pollution of a loch by sewage from a piggery, and later on he was called in to advise in the matter. The existing plant consisted of a septic tank, followed by double-contact beds fed by a dosing chamber, the second contact effluent being distributed over a small area of underdrained land before entering the loch. The existing plant was good of its kind, and would have turned out a good effluent from an ordinary domestic sewage of average strength, but the contact beds were not anything like capable of oxidising the very strong liquid with which it had to deal, although this was diluted with something like twice its own volume of loch water. Later, the original contact medium (broken bricks) was replaced by hard clinker, but the effluent, although perceptibly improved, was still a strongly polluting liquor. It was necessary, in this particular case in question, to obtain a very good effluent, and the writer advised a deep percolating filter to treat the second contact bed liquor, the filtering material being hard, medium-sized clinker, a shallow mechanical sand filter following, to remove suspended solids. The filtering material while being placed in position in the filter was kept moistened with a solution of sewage and garden soil, since it was of the utmost importance that the filter should yield good results within a very short interval of time. As the filling of the filter neared completion, a transition was gradually effected from domestic to piggery sewage.

The filter gave good results from the first, when [illegible] and after the filter had only been in operation for a few days, nearly 60 parts of nitrate per 100,000 showed in the effluent, while free nitric acid was found to be present.

The following analysis shows the nature of the [illegible]

	Parts per 100,000
[illegible]	[illegible]
Albuminoid ,,	·09
Nitric ,,	58·5
[illegible]	
ganate	·42
[illegible]	·57
Suspended [illegible] ...	·9

The volume of diluting water was subsequently reduced to about 50 per cent of the piggery sewage, after the filter had been running for about a couple of months, the effluent still remaining of high quality. The figures for nitric nitrogen dropped to about 16 parts per 100,000, the suspended solids rising to about 1 part.

Dust Prevention.—The Crown Estate Commissioners [illegible]

Councillors and Road Maintenance.—[illegible] have adopted a proposal of the Highway Committee with respect to responsibility for the maintenance of the roads. This is that each year, before the scheme of work for the following year is drawn up, the committee should personally visit the different parishes in the district and acquaint themselves with the condition of the roads and the requirements of the different areas. The committee did not suggest that the surveyor's discretion in undertaking local repairs from time to time should in any way be impaired, but they felt that if the members assumed direct responsibility for the preparation of the main programme it would be possible to secure greater continuity of policy and to lessen local grievances by a personal inquiry into local needs on the spot.

* The figure for chlorine is sometimes as high as 50 parts per 100,000 —G. B. K.

Definitions of Road Terms.

AMERICAN ENGINEERING SOCIETY'S RECOMMENDATIONS.

[The appended matter forms the concluding portion of the recently-presented report of the Special Committee on Bituminous Materials for Road Construction and on Standards for their Test and Use, appointed by the American Society of Civil Engineers. The first part of the report, reproduced in our issue of March 5th, set out the Committee's suggestions regarding the analysis and testing of bituminous materials and their conclusions on the subject generally.]

For the sake of uniformity and clearness, the committee recommends that the following lists of terms or frequent use in expressions relating to highway work be recognised as having the meanings set forth in the list, unless otherwise definitely stated at any time by a user of such term or terms. The committee further recommends that new terms or phrases, coined with the idea of expressing delicate shades of meaning through the medium of one or two words rather than by longer expressions, be suggested or used only after full, careful, and conservative consideration for the sake of avoiding to the utmost further confusion in the use of terms. In the list given will be found some terms and definitions adopted by the American Society for Testing Materials, others by the American reporter on Communication No. 10 at the Third International Road Congress, and other terms and definitions which have been proposed by the Committee on "Standard Tests for Road Materials" of the American Society for Testing Materials. The committee wishes to acknowledge here its obligations for suggestions thus reaching it.

DEFINITIONS.

Aggregate.—The mineral material, such as sand, gravel, shells, slag, or broken stone, or combinations thereof, with which the cement or the bituminous material is mixed to form a mortar or concrete. Fine aggregate may be considered as the mineral inert material which will pass a ¼-in. screen, and coarse aggregate the material which will not pass a ¼-in. screen.

Asphalt.—Solid or semi-solid native bitumens, solid or semi-solid bitumens obtained by refining petroleums, or solid or semi-solid bitumens which are combinations of the bitumens mentioned with petroleums or derivatives thereof, which melt on the application of heat, and which consist of a mixture of hydrocarbons and their derivatives of complex structure, largely cyclic and bridge compounds.

Asphalt Block Pavement.—One having a wearing course of previously prepared blocks of asphaltic concrete.

Asphalt Cement.—A fluxed or unfluxed asphaltic material, especially prepared as to quality and consistency, suitable for direct use in the manufacture of asphaltic pavements, and having a penetration of between 5 and 250.

Asphaltenes.—The components of the bitumen in petroleum, petroleum products, malthas, asphalt cements, and solid native bitumens, which are soluble in carbon disulphide, but insoluble in paraffin naphthas.

Asphaltic.—Similar to, or essentially composed of, asphalt.

Base.—Artificial foundation.

Binder.—(1) A foreign or fine material introduced into the mineral portion of the wearing surface for the purpose of assisting the road metal to retain its integrity under stress, as well as perhaps to aid in its first construction. (2) The course, in a sheet-asphalt pavement, frequently used between the concrete foundation and the sheet-asphalt wearing surface, composed of graded sand and asphalt cement.

Bitumen.—A mixture of native or pyrogenous hydrocarbons and their non-metallic derivatives, which may be gases, liquids, viscous liquids, or solids, and which are soluble in carbon disulphide.

Bituminous Cement.—A bituminous material suitable for use as a binder having cementing qualities which are dependent mainly on its bituminous character.

Bituminous Concrete Pavement.—One composed of stone, gravel, sand, shell, or slag, or combinations thereof, and bituminous materials incorporated together by mixing methods.

Bituminous Macadam Pavement.—One having a wearing course of macadam with the interstices filled by penetration methods with a bituminous binder.

Bituminous Material.—Material containing bitumen as an essential constituent.

Liquid Bituminous Material.—Bituminous material showing a penetration at normal temperature under a load of 50 grammes applied for one second of more than 350.

Semi-solid Bituminous Material.—Bituminous material showing a penetration at normal temperature under a load of 100 grammes applied for five seconds of more than 10, and under a load of 50 grammes applied for one second of not more than 350.

Sold Bituminous Material.—Bituminous material showing a penetration at normal temperature under a load of 100 grammes applied for five seconds of not more than 10.

Bituminous Pavement.—One composed of stone, gravel, sand, shell or slag, or combinations thereof, and bituminous materials incorporated together.

Bituminous Surface.—A superficial coat of bituminous material with or without the addition of stone or slag chips, gravel, sand or material of similar character.

Blanket.—See "Carpet."

Bleeding.—The exudation of bituminous material on the roadway surface after construction.

Blown Petroleums.—Semi-solid or solid products produced primarily by the action of air upon originally fluid native bitumens which are heated during the blowing process.

Bond.—The combined action of inertia, friction, and of the forces of adhesion and cohesion which helps the separate particles composing a crust or pavement to resist separation under stress. Mechanical bond is the bond produced almost wholly, in a well-built broken-stone macadam road, by the interlocking of angular fragments of stone and the subsequent filling of the remaining interstices with the finer particles.

Bound.—Bonded.

Water-bound.—Bonded with the aid of water.

Bituminous-bound.—Bonded with the aid of bituminous material.

Brick Pavement.—One having a wearing course of paving bricks or blocks.

Bridge.—A structure for the purpose of carrying traffic over a gap in the road-bed measuring 10 ft. or more in the clear span.

Camber of a Road.—See "Crown."

Camber of a Bridge.—The rise of its centre above a straight line through its ends.

Carbenes.—The components of the bitumen in petroleums, petroleum products, malthas, asphalt cements, and solid native bitumens, which are soluble in carbon disulphide, but insoluble in carbon tetrachloride.

Carpet.—A bituminous surface of appreciable thickness, generally formed on top of a roadway by the application of one or more coats of bituminous material with gravel, sand or stone chips added.

Cement.—An adhesive substance used for uniting particles of other materials to each other, ordinarily applied only to calcined "cement rock," or to artificially prepared, calcined and ground mixtures of limestone and silicious materials. Sometimes used to designate bituminous binder used in bituminous pavements, when the expression "bituminous cement" (q.v.) is understood to be meant.

Cement Concrete.—An intimate mixture of gravel, shell, slag or broken stone particles with certain proportions of sand or similar material, cement, and water, made previous to placing.

Cement Concrete Pavement.—One having a wearing course of hydraulic cement concrete.

Cemented.—Bonded. Referring to water-bound macadam, the term "cemented" is used to designate that condition existing when, after rolling the stone forming the crust, the remaining voids have been filled with the finer sizes, and the stone dust or "flour" has, under the action of water, "set" as does cement itself.

Chips.—Small angular fragments of stone, coarser than grit.

Clay.—Finely divided earth, generally silicious and

atuminous, which will pass a 200-mesh sieve. Also see "Gravel."

Coal Tar.—The mixture of hydrocarbon distillates, mostly unsaturated ring compounds, produced in the destructive distillation of coal.

Coat.—See "Carpet." (1) The total result of one or more single surface applications. (2) To apply a coat.

Coke-oven Tar.—Coal tar produced in by-product coke ovens in the manufacture of coke from bituminous coal.

Consistency.—The degree of mobility or fluidity of bituminous materials.

Course.—One or more layers of road metal placed and compacted separately, for the formation of the road or pavement. Courses are usually referred to in the order of their laying as first course, second course, third course, &c., or as a single road block in a pavement.

Crown.—The rise in cross-section from the sides to the highest part of the finished roadway. It may be expressed either as so many inches per foot of width, or as a fraction per foot of distance from side to centre—*i.e.*, "the crown is 4 in.," or "the crown is ¼ in. to the foot."

Crusher Run.—The total unscreened product of a stone crusher.

Crusher-run Stone.—The product of a stone-crusher, unscreened except for the removal of the particles smaller than remaining on about a ¼-in. screen.

Crust.—That portion of a macadam or similar roadway above the foundation consisting of the road metal proper with its bonding material or binder.

Culvert.—A structure for the purpose of carrying traffic over a gap in the road-bed, measuring less than 10 ft. in clear span.

Cut-back Products.—Petroleum, or tar residuums, which have been fluxed, each with its own or similar distillates.

Dead Oils.—Oils, which are heavier than water, which are distilled from tars.

Dehydrated Tar.—Tar from which the water has been removed.

Ditch.—The open-side drain of a roadway, usually deep in proportion to its width, and unpaved.

Drainage.—Provision for the disposition of water.

Side Drainage.—That along the sides of the roadway.

Sub or Under Drainage.—That below the surface.

Surface Drainage.—That on the roadway or ground surface.

V Drainage.—That provided by the construction of troughs in the sub-grade of the roadway, which troughs are like a V, with flat, sloping sides, and are filled with stone.

Dust.—Earth or other matter in fine, dry particles, so attenuated that they can be raised and carried by air currents. The product of the crusher passing through a fine sieve.

Dust-layer.—Material applied to a roadway for temporarily preventing the formation or dispersion under traffic of distributable dust.

Earth Road.—A roadway composed of natural earthy material.

Emulsion.—A combination of water and oily material made miscible with water through the action of a saponifying or other agent.

Expansion Joint.—A separation of the mass of a structure, usually in the form of a joint filled with elastic material, which will provide opportunity for slight movement in the structure.

Fat.—Containing an excess. A fat asphalt mixture is one in which the asphalt cement is in excess, and the excess is clearly apparent.

Filler.—(1) Relatively fine material used to fill the voids in the aggregate. (2) Material used to fill the joints in a brick or block pavement.

Fixed Carbon.—The organic matter of the residual coke obtained upon burning hydrocarbon products in a covered vessel in the absence of free oxygen.

Flour.—Finely ground rocks or minerals pulverised to an impalpable product.

Flush Coat.—See "Seal Coat."

Flushing.—(1) Completely filling the voids. (2) Washing a pavement with an excess of water.

Flux.—Bitumens, generally liquid, used in combination with harder bitumens for the purpose of softening the latter.

Footway.—The portion of the highway devoted especially to pedestrians. A sidewalk.

Foundation.—The portion of the roadway below and supporting the crust or pavement.

Artificial Foundation.—The layer of the foundation especially placed on the sub-grade for the purpose of reinforcing the supporting power of the latter itself, and composed of material different from that of the sub-grade proper.

Free Carbon.—In tars, organic matter which is insoluble in carbon disulphide.

Gas-house Coal Tar.—Coal tar produced in gas-house retorts in the manufacture of illuminating gas from bituminous coal.

Grade.—(1) The profile of the centre of the roadway, or its rate of rise or fall. (2) Elevation. (3) To establish a profile by cuts and fills or earthwork. (4) To arrange by sizes broken stone, gravel, sand or combinations of such materials.

Gravel.—Small stones or pebbles usually found in natural deposits, more or less intermixed with sand, clay, &c., but in which mixture the particles which will not pass a ten-mesh sieve predominate. Gravel clay, gravel sand, clayey gravel, and sandy gravel indicate the varying proportions of the finer-sized particles. The differentiation between gravel, sand, silt and clay should be made on the following basis:—

Size of particles	Names
Retained on a ¼-in. mesh	Gravel
Passing a ¼-in. mesh and retained on a 200-mesh	Sand
Passing a 200-mesh sieve	Silt or Clay

Pea Gravel.—Clean gravel the particles of which [illegible] gravel from [illegible] fine) material.

Gutter.—The artificially surfaced and generally shallow waterway provided usually at the sides of the roadway for carrying surface drainage. Occasionally used synonymously with "ditch," but incorrectly so, as "gutters" are always paved or otherwise surfaced, and ditches are not.

Hermetic.—The [illegible] of a roadway. Sometimes also called "quarters."

Highway.—The entire right of way devoted to public travel, including the sidewalks and other public spaces, if such exist.

Layer.—A [illegible] application.

Loam.—Finely divided earthy material containing a considerable proportion of organic matter.

Macadam.—A road crust composed of stone or similar material broken into irregular angular fragments compacted together so as to be interlocked and mechanically bound to the utmost possible extent.

Mastic.—A mixture of bituminous material and fine mineral matter suitably made for use in highway construction and for application in a heated condition.

Mat.—See "Carpet."

Matrix.—A composition or material forming a cushion, or binding the aggregate together.

Mesh.—The square opening of a sieve.

Metal.—See "Road Metal."

Mortar.—A mixture of fine material, such as sand, cement, and water or other liquid suitably proportioned, and incorporated together for the purpose for which it is used.

Mush.—A greasy mud sometimes found on bituminous crusts.

Normal Temperature.—In laboratory investigations 25 deg. Cent. (77 deg. Fahr.).

Oil-gas Tars.—Tars produced by cracking oil vapours in the manufacture of oil gas.

Patching.—Repairing or restoring small isolated areas in the surface of the metalled or paved portion of the highway.

Palliative.—A short-lived dust-layer.

Pavement.—The wearing course of the roadway or footway when constructed with a cement or bituminous binder, or composed of blocks or slabs, together with any cushion or "binder" course.

Penetration.—In laboratory investigations the distance, expressed in tenths of a millimetre, entered a sample by a No. 2 cambric needle operated in a machine for the purpose and under known conditions of loading, time and temperature. The degree of solidity of bituminous materials. In construction, the entrance of bituminous material into the interstices of the metal of the roadway.

Penetration method.—The method of constructing a bituminous macadam pavement by pouring or grouting the bituminous material into the upper course of the road metal before the binding of the latter has been completed.

Pitch.—Solid residue produced in the evaporation or distillation of bitumens, the term being usually applied to residue obtained from tar.

Hard Pitch.—Pitch showing a penetration of not more than 10

Soft Pitch.—Pitch showing a penetration of more than 10.

Straight-run Pitch.—A pitch run in the initial process of distillation to the consistency desired without subsequent fluxing.

Pocket.—A hole or depression in the wearing course.

Pothole.—A hole extending below the wearing course.

Profile.—A longitudinal section of a highway, generally taken along the centre line.

Quarters.—The four sections of equal width which, side by side, make up the total width of a roadway.

Ravelling.—The loosening of the metal composing the crust.

Refined Tar.—A tar freed from water by evaporation or distillation, which is continued until the residue is of desired consistency, or a product produced by fluxing tar residuum with tar distillate.

Renewals.—Extensive repairs over practically the whole surface of the metalled or paved portion of the highway.

Repairs.—The restoration or mending of a considerable amount of the metalled or paved portion of the highway, but not usually of a majority of the surface area. More extensive than "Patching," but less so than "Renewals."

Resurfacing.—The renewal of the surface of the crust or pavement.

Road.—A highway outside of an urban district.

Road-bed.—The natural foundation of a roadway.

Road Metal.—Broken stone, gravel, slag, or similar material used in road and pavement construction and maintenance.

Roadway.—That portion of a highway particularly devoted to the use of vehicles.

Rock Asphalt.—Sand-stone or lime-stone naturally impregnated with asphalt.

Rock Asphalt Pavement.—A wearing course composed of broken or pulverised rock asphalt with or without the addition of other bituminous materials.

Sand.—Finely divided rock detritus, the particles of which will pass a 16-mesh and be retained on a 200-mesh screen. Also see "Gravel."

Sand-clay Road.—A roadway composed of an intimate mixture of sand and clay.

Scarify.—To loosen and disturb superficially.

Screen.—In laboratory work an apparatus, in which the apertures are circular, for separating sizes of material.

Screenings.—Broken rock of a size that will pass through a ½-in. to ¾-in. screen, depending on the character of the stone.

Seal Coat.—A final superficial application of bituminous material during construction to a bituminous pavement.

Setting Up.—The relatively quick change such as takes place in a bituminous material after its application to a roadway, indicated by its hardening after cooling and exposure to atmospheric and traffic conditions, as opposed to the slower changes later occurring gradually and almost imperceptibly.

Shaping.—Trimming up and preparing a rut or track preparatory to applying the first course of the road metal or artificial foundation.

Sheet-asphalt Pavement.—One having a wearing course composed of asphalt cement and sand of predetermined grading, with or without the addition of fine material, incorporated together by mixing methods.

Sheet Pavement.—A pavement free from frequent joints such as would accompany small rectangular blocks and which has an appreciable thickness (say, in excess of 1 in. on the average) for its wearing course.

Shoulders.—The portion of the highway between the edges of the road metal or pavement and the gutters, slopes, or watercourses.

Side Drain.—See "Drainage."

Sidewalk.—The portion of the highway reserved for pedestrians.

Sieve.—In laboratory work an apparatus, in which the apertures are rectangular, for separating sizes of material.

Silt.—Naturally deposited fine earthy material, which will pass a 200-mesh sieve. Also see "Gravel."

Spalls.—Fragments broken off by a blow, irregular in shape, and of such size to be convenient to the original mass.

Squeegee.—A tool with a rubber or leather edge for scraping or cleaning hard surfaces, or for spreading and distributing liquid material over and into the superficial interstices of roadways.

Squeegee Coat.—An application by means of the squeegee.

Stone Block Pavement.—One having a wearing course composed of stone blocks quite or nearly rectangular in shape.

Street.—A highway in an urban district.

Sub-grade.—The upper surface of the native foundation on which is placed the road metal or the artificial foundation, in case the latter is provided.

Superficial Coat.—A light surface coat.

Surface Coat.—See "Carpet."

Surfacing.—(1) The crust or pavement. (2) Constructing a crust or pavement. (3) Finally finishing the surface of a roadway. (4) Treating the surface of a finished roadway with a bituminous material.

Surface Treatment.—Treating the finished surface of a roadway with bituminous material.

Tailings.—Stones which after passing through the crusher do not pass through the largest openings of the screen.

Tar.—Bitumen which yields pitch upon fractional distillation and which is produced as a distillate by the destructive distillation of bitumens, pyro-bitumens, or organic material.

Telford.—Properly an artificial foundation advocated by Thomas Telford (1757-1820), and consisting of a pavement of stone about 8 in. thick, laid by hand, and closely packed and wedged together. The individual stones were desired to be about 16 sq. in. in section, and about 8 in. in length. They were set close together on the prepared sub-grade, their longest dimension vertical and on their larger ends, their interstices chinked with smaller stones, and the whole rammed (or rolled) until firm and unyielding.

Telford Macadam.—Macadam with an artificial foundation of Telford.

Under-drain.—See "Drainage."

Upkeep.—Maintenance.

V Drain.—See "Drainage."

Viscosity.—The degree of fluidity of bituminous materials.

Volatile.—Applied to those fractions of bituminous materials which will evaporate at climatic temperatures.

Water-bound.—Bound or bonded with the aid of water.

Water-gas Tar.—Tar produced by cracking oil vapours in the manufacture of carburetted water-gas.

Wearing Coat.—The superficial layer of the crust or pavement exposed to traffic.

Wearing Course.—The course of the crust or pavement exposed to traffic.

Wood Block Pavement.—One having a wearing course composed of wood paving blocks, generally rectangular in shape.

The committee has carefully considered the advisability of presenting a progress report on "Materials other than Bituminous." Owing to the time which it has been obliged to devote to the above report on "Bituminous Materials," it has been unable to consider any but the most general questions relating to other materials. The committee has been impressed with the fact that there is a wide divergence of opinion and of practice with respect to the use of such materials, but that it might attempt to present some standards and principles which are fairly well defined and quite generally accepted, and to suggest other matters which should receive attention and be made the subject of investigation by highway engineers. The majority of the committee feels, however, that it should defer a progress report on "Materials other than Bituminous" until [illegible] sions.

The Roads of Flanders. A correspondent of the *Daily Telegraph* writes from France [illegible] about the present condition of the roads in Flanders. "The country is [illegible] of the hedges or the fences of our English countryside, there are the 'roads.' They vary from the good, if horribly jolty, paved highway to the small cross roads, which are now but little better than mud canals. Many years ago our Army learned to swear in Flanders. It is a necessary part of the soldier's equipment in this part of the country, and the two great objects of his eloquence are the mud and the roads. Yet thanks to the [illegible] have worn wonderfully well. They go to pieces here and there [illegible] displaying their ingenuity; but, on the whole, they have been the most [illegible] success."

THE NATIONAL ROAD CONFERENCE AND EXHIBITION (1915).

We are informed that a National Road Exhibition has been organised by the County Councils Association of England and Wales to take place from June 30th next to July 1st at the Royal Horticultural Hall, London. At the same time there will be held a conference at which important points connected with the road question will be discussed. The dates of the conference and exhibition partly coincide with the dates of the annual meeting of the Institution of Municipal and County Engineers, which will be held in London this year.

The County Councils Association has been invited to take part in the organisation of the conference and exhibition by representatives of the Road Board and by borough and district surveyors. The Organising Committee, which will be further enlarged, includes at present:—

The Right Hon. H. Hobhouse (chairman of the Somerset County Council, Bruton).
Mr. J. Aspden (chairman of the Local Government Committee).
Mr. H. Hampden (Clerk of the Road Board to the National Road Board).
Colonel G. Dixon (chairman of the Oxford County Council).
Sir H. George Fordham (surveyor to the Cambridgeshire County Council).
Mr. Frank Harris (engineer and surveyor to the Tonbridge Rural District Council).
Mr. T. H. B. Hesketh (county surveyor of Norfolk).
Mr. W. Rees Jeffreys (secretary to the Road Board).
Mr. A. C. Pain (chairman of the Special Highways Committee).
Mr. R. S. W. Pickering (county surveyor of the Isle of Ely).
Mr. Dudley Roberts (vice-president of the Institution of Municipal and County Engineers).
Mr. O. C. Robinson (surveyor to the Wimbledon Urban District Council).
Mr. Norman Scott (borough engineer and surveyor, Hackney).
Mr. Henry E. Stilgoe (city engineer and surveyor, Birmingham).
Mr. H. T. Wakelam (county engineer of Middlesex, and president of the Institution of Municipal and County Engineers).

The organising secretary is Mr. G. Montagu Harris, secretary of the County Councils Association, and Mr. Frances Hyndman is assistant secretary.

The preliminary arrangements regarding the dates of the conferences and meetings are as follows:—

June 7th and 8th.—Annual meeting of the Institution of Municipal and County Engineers, when the following subjects will be discussed:—

(1) The improvement and maintenance of highways in connection with modern traffic conditions.
(2) The use of reinforced concrete in building, road construction, &c.
(3) Town Planning.
(4) Haulage by mechanical motive power from an economical point of view.
(5) Restriction and control of heavy traffic, both as regards weight and speed.
(6) The maintenance and strengthening of steel and steel bridges.

June 8th.—Conference on "The Adequacy of Bituminous Roads with special reference to the subject of Corrugations," and other matters.

June 9th.—Conference on "Heavy Traffic."

June 10th.—Morning: Meeting of Executive Council of County Councils Association. Afternoon: Conference on the "Classification of Roads."

July 1st.—Conference on "The Reconstruction of Roads in Belgium," arranged jointly by the County Councils Association and a special committee which has been formed in connection with the rebuilding of Belgium.

Arrangements as to other meetings on the above days will be announced separately as soon as the full programme is definitely settled.

We understand that invitations will be sent not only to county councils, but to all local authorities in the Kingdom for the attendance of members of their Highway Committee, engineers, surveyors and clerks, also to members of Parliament, to French, Belgian and other foreign engineers in this country, and to all societies and institutions who are concerned with the control and care of roads. The conference on July 1st on the reconstruction of roads in Belgium is one of a series on the reconstruction of Belgium inaugurated by the conference at the Guildhall in February last, which received such cordial support from Belgian and British authorities.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

EASTERN DISTRICT MEETING AT WESTMINSTER.

Mr. H. T. Wakelam, the president-elect, occupied the chair at the Eastern District meeting of the Institution of Municipal and County Engineers held on Saturday afternoon last at the institution offices, the attendance including Messrs. J. S. Pickering (president), E. Willis (Chiswick), J. W. Cockrill (Great Yarmouth), E. J. Elford (Southend-on-Sea), A. E. Collins (Norwood), F. W. Pearce (Twickenham), R. R. Hogsden (Middlesex), H. F. Wilkinson (Tottenham), P. T. Hewitson (Cuckfield), E. Brown (Southall-Norwood), W. H. Prescott (Tottenham), W. Gornall (Hendon), J. Desborough (Willesden) and James A. Webb (Hendon, hon. secretary).

The minutes of the meeting at Tilbury were read, confirmed and signed by the chairman.

APPOINTMENT OF OFFICERS.

On the motion of Mr. Brown, and seconded by Mr. Willis, the whole of the retiring Executive Committee were reappointed with the substitution of the name of Mr. Pearce, of Twickenham, in place of Mr. C. Vawser (Hatfield), who had resigned on leaving the Eastern District.

Mr. Prescott moved and Mr. Willis seconded the re-election of Mr. Wakelam as chairman for the ensuing year, and this was carried unanimously.

On the motion of the chairman, seconded by Mr. Elford, the members resolved to support the nomination of Mr. J. A. Webb as one of the Eastern District representatives on the council for the ensuing year.

Mr. Elford proposed and Mr. Cockrill seconded the nomination of Mr. Willis as the other representative of the Eastern District on the council for the coming year. This was agreed to unanimously.

Mr. Webb moved and Mr. Brown seconded the resolution to invite Mr. H. Collins, of Colchester, to take over the position of hon. secretary of the Eastern District for the year 1915 to 1916. The motion was carried.

On the motion of Mr. Webb, seconded by Mr. Willis, it was decided to elect Mr. F. W. Smart, of Bedford, as sub-district secretary for the counties of Beds, Bucks and Northants.

MOTORS AND ROADS.

The appointment of a departmental committee to discuss the questions of loads, diameter and width of tyres on motor vehicles using roads, and the question of by-laws, was mentioned by several members, and the general opinion was expressed that these matters should be discussed and the opinion of each district obtained and forwarded to the council of the institution.

Arising out of the above discussion, it was proposed by Mr. Brown and seconded by Mr. Prescott "that, as a general principle, the attention of the council be drawn to the appointment of departmental committees selected to take evidence and discuss matters affecting the institution, and that the council be asked to obtain the opinion of each district on these matters."

The motion was carried unanimously.

Mr. Brown agreed to a meeting being held at Southall any Saturday afternoon convenient to the members. The arrangements were left in the hands of the secretary.

The customary vote of thanks to the chairman for presiding was passed on the motion of Mr. Brown, seconded by Mr. Willis.

MATLOCK MEETING.

At the last meeting of Matlock Urban District Council it was agreed to give facilities for the holding of a meeting of the Institution of Municipal and County Engineers in that town in May next.

Disposal of Domestic and Trade Refuse.

SPECIAL COMMITTEE'S REPORT TO BERMONDSEY BOROUGH COUNCIL.

In June of last year Mr. R. J. Angel, M.INST.C.E., M.R.I.B.A., the borough engineer and surveyor, drew the attention of the General Purposes Committee of Bermondsey Borough Council to the advantages of the Patent Lightning Crusher Company's well-known system of treating refuse—already in operation in Southwark, Hove, Halifax, Glasgow, Ruislip, and other towns.

The borough engineer's suggestion had for its object the abolition of the dust and smell which is produced during burning, and of the clinker residue, which approximates to about one-third of the refuse consumed, and is difficult to get rid of without heavy expense to the council. At present only such description and quality of refuse is accepted as is sufficiently combustible and useful for raising steam, and an increasingly large quantity is constantly rejected and being diverted to the council's contractor for shooting either into a barge or on to land. In their report at the time the committee pointed out that the suggestions embraced the disposal of the dry road sweepings, and would therefore reduce the cost of shooting.

The committee went on to explain that under the system in question no clinker or flue dust was produced; on the contrary, the refuse would bear a judicious amount of furnace clinker from factories, which was now refused by the dust destructor, particularly had to be paid for on disposal, being [illegible]. Under the present arrangements of the [illegible] naturally frequently happened that vans which [illegible]d at 4 or 5 o'clock p.m. were still loaded [illegible] the morning, and ten or twelve carmen had to wait until from 6 o'clock to 7 or 7.45 a.m. for the vans to be unloaded, as the cells had not consumed the quantity shot overnight, thus causing serious delay. Under the new arrangements this would not occur, as the plant would deal with the refuse as collected from 6 a.m. to 5 p.m., there being no delay in waiting for a cell to consume its charge. It was added that the resulting material from the plant possessed high fertilising properties, and was purchased by the farmers from the borough of Southwark, who were unable to meet all the demands made on them.

The operation of the plant was explained as follows:—

The refuse was taken to the plant in the covered vans as collected, when it was [illegible] from the hoppers. The large tins only were thrown on one side and disposed of as at present, the contractors paying the council £1 6s. per ton for bright tins, and 2s. per ton for rough metal. The whole of the dust was then shovelled into a perforated chamber in which four hammers revolved at a speed of 1,200 revolutions per minute, the result being that during the course of sixty seconds an article would receive 4,800 blows delivered with considerable force so that the dust, ashes, garbage, and even the smaller tins and paper were reduced to coarse powder, falling into a travelling conveyor and discharging direct into a van, wagon or barge as the case might be.

It was suggested that a plant of this type should be fixed in the old destructor house at Rotherhithe, and the crushed refuse material delivered into barge for shipment to farmers. In order to deal with the whole of the council's collection of dust and trade refuse, which amounted to a maximum of about 85 tons per day, three cells would be required, and one spare cell as a stand-by for repairs or accident. The old destructor building was complete and in working order, together with its inclined roadway, and was ready for the first two hoppers, but for the next two the tipping floor must be extended. It was suggested that the building and land now used for the dust destructor might be transferred to the electric light department for extensions of their plant, while capital charges of the dismantled cells and furnaces were charged to the new scheme.

The proposal being regarded as worthy of consideration, a special committee was, on the recommendation of the committee, appointed to report on the matter. This committee subsequently saw the Southwark plant in operation, and as a result gave instructions for the preparation of a report showing what the cost would be if the council decided to deal with the existing destructor and erect plant at Rotherhithe. They also directed that [illegible] should be issued inviting offers from farmers, dairymen and horticulturists for the resultant material; to these, however, there was no response. An offer had, however, been made to remove the whole material free on board, and keep the council clear.

The committee, in their report to the council on Tuesday, submitted the following tables:—

COST OF PLANT.

The total cost of the whole of the plant is as follows:—

	£	£
Conveyor	400	
Crushers (four)	1,600	
Shafting, pulleys, &c.	240	
Erection	100	
Four 40 b.h.p. motors at £100	400	
One 4 b.h.p. motor at £25	25	
		2,765
Foundations for motors &c., extension of tipping floor		295
General repairs to building		120
Total cost of plant and building operations		£3,180

CAPACITY OF PLANT AND PARTICULARS OF DUST COLLECTION.

The output of each cell is guaranteed at 4 tons, or 3 tons in actual working, or 90 tons for the three working cells per day of ten hours. The average daily collection of council's dust and trade refuse is as follows, in tons:—

	House refuse. Tons.	Trade refuse. Tons.
Monday	80	5
Tuesday	67	3½
Wednesday	56½	1½
Thursday	55	1½
Friday	54½	2
Saturday	46½	2

During the year 1913 the following amount of refuse was disposed of:—

	Tons. Cwt.	Equal to a weekly collection of Loads.	Tons.
House refuse			
To destructor, 11,143 loads	17,162 19	214	330
To barge or shoot, 185 ,,	284 19	3½	5
Trade refuse			
To destructor, 1,470 ,,	1,365 16	28	26
To barge or shoot, 626 ,,	581 12	12	11
An annual total of 19,395 tons on an average weekly total of say, 20,000 tons per annum		257	372

The dry road sweepings from the Rotherhithe area, which contain a good deal of manure, can be added to the crushed material, and so reduce the cost of shooting.

ANNUAL COST OF RUNNING PLANT.

The cost of running the plant will be as follows for three cells in operation:—

	£ s.	£ s.
Labour—		
2 men per cell feeding, 6 men at 35s. 6d.	553 16	
1 leading hand capable of attending to machinery at 40s.	104 0	
1 man running barge at 35s. 6d.	92 6	
1 man removing, attending on men at cells at 35s. 6d.	92 6	
		842 8
Electric current for motors to cells on an actual running of 8 hours per day (variable load) and current for conveyor taken on a constant running of 10 hours per day		650 0
Upkeep of plant		100 0
Repairs and upkeep of building		25 0
Add for additional cartage		150 0
Part wages of watchman		50 0
Depot charges		300 0
Capital charges on plant for 10 years		366 0
Average capital charges on disused cells and furnaces at destructor for next 6 years from April 1st, 1915		262 6
		3,045 14
Credit sale of old tins		160 0
Total cost per annum		£2,885 14

It would be noted that a sum [illegible] included for additional cartage which would be entailed in taking

the refuse to Bull Hurst Road, it would pay to be rid of the destructor.

DISPOSAL OF MUNICIPAL ASHES, REFUSE, &c.

The borough of Southwark covers 1,207 acres, and has a population of 231,000. It is under contract to deliver the ashes, refuse, &c., from the plant at the rate of 4s. per ton. Charges on the plant as it now stands are £1,500 per annum, and when the new plant is completed the annual charges will be £2,000. The following is a statement of the cost of crushing and disposal at Southwark:—

Month of June, 1913.

	s.	d.
Total cost of crushing	3	4 per ton.
Carriage to country [illegible] from London	4	8
	7	11
Receipts from owners for ashes, refuse, &c.	3	7
Cost to ratepayers	4	4 per ton.

(which covers all expenses of the Dust Destructor Department).

COST PER TON FOR CRUSHING.

The [illegible] amounted to £2,880 14s. 6d., which works out at 1 ton 2 cwts. per hour. The refuse is crushed. If the dust and garbage from Bermondsey is mixed with the crushed refuse it will save £100 per month, and reduce the cost of crushing to 2s. 9d. per ton.

The cost of disposing of the refuse and dust resulting from the destruction for the year ended 1913 was 4s. 7.8d. per ton, and for the year 1913-14 it was 4s. 10.5d. per ton, so that the difference between the two years would be £2,000 per annum on the last-mentioned figure, exclusive of the standing charges for the building, land, boilers, &c., amounting to £1,205 12s. 9d., thus reducing the income to £1,796.

The committee thought it was possible that alterations in the method of destruction and disposal might be made which would be more profitable still to the council, and that, even should the estimated saving not be realised, it would still be a very great advantage to have the ashes dealt with in the borough. They accordingly recommended that tenders should be invited for the erection of plant. On Tuesday the Finance Committee of the council recommended that a loan of £6,000 be granted, subject to the approval of the Treasury being given to the expenditure. The necessary steps would be taken to obtain a loan of £1,250 for the purpose of carrying out the scheme.

Middleton Sewage Works. The Middleton Town Council and the Manchester Corporation have agreed to pay to Mr. James Daggle the sum of £800 to be equally borne by the authorities for preparing a scheme of sewerage for Middleton which was eventually abandoned in favour of handing over the treatment and disposal of the sewage of Middleton to the Manchester Corporation. The Middleton Corporation have now decided to hand over the present sewage works to the Manchester Corporation. Manchester is giving £10,000 for the consideration. Middleton is also to be indemnified against any action by the Mersey and Irwell Joint Committee.

The Height of Buildings.—The Doncaster Corporation Bill was before the Local Legislation Committee last week, and was ordered to be reported to the House of Commons for third reading. Some discussion took place on Clause 77, dealing with the height of new buildings. The borough surveyor, Mr. F. O. Kirby, stated that the clause as to 30 ft. was not that height was asked for because it was found that with a height of 30 ft. it was possible to put on a third story, which was not deemed advisable. There were at the present time in Doncaster shops of over 30 ft. in height. Employees slept in these, and he was apprehensive that as the development of Doncaster shops might be built to a greater height which was not desirable. The chairman, Mr. Middlebrook, said the committee were with the promoters as the object it was desired to obtain, but they were a little in difficulty as to the provisions. They thought they would take the wise course if they passed the clause giving 35 ft. as the limit of height, not limiting anything in it as to the number of persons resident on the premises, but relying on the fact that the corporation was only to require such measures as were reasonably possible, with power to appeal in the impossible event of the clause not being interpreted in the required sense. The Bill authorises an expenditure of £50,000 for an isolation hospital, and £46,000 for works of street improvement.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Why [illegible] specially read the [illegible] of the Prime Minister to the Peace Conference with approbation after the appointment? Who was the politician who once stated that, in his opinion, "England worried through her wars [illegible] in spite of the Government"?

* * * *

Would not the excellent illustrated pamphlet by Mr. G. Bertram Hurst, surveyor to Alton Urban, entitled "The Surveyor on Military Service," be of [illegible] to surveyors who are at present in contact with military operations in this country, but [illegible] engineers, which has been incorporated with the City of London National Guard? Does it not show a patriotic spirit when a surveyor produces a work of this kind without receiving any *quid pro quo*?

* * * *

[illegible] that whether the present strikes are the fault of the men or the masters, the effect has been disastrous at this crisis, not only in preventing munitions of war reaching our troops and those of our Allies, but particularly in the moral [illegible] neutral nations, who naturally believe that this country is not [illegible] bring the war to a successful issue? Do those responsible for the strikes reflect that every hour's delay means a prolongation of the war and further deaths and disablements among our brave countrymen who are defending our hearths and homes?

* * * *

[illegible] that the small domestic charcoal filter of the past, which was never very satisfactory, is giving way to larger mechanical filters in which cleanliness, as well as a complete filtration [illegible] is secured. Is not the [illegible] mechanical filter illustrated and explained in the issue of THE SURVEYOR of the 5th inst., and designed and manufactured by Messrs. Mather & Platt, "just the thing" for large houses, institutions, and so forth, but, above all, for the Front, [illegible] of the utmost importance?

* * * *

[illegible] issued by the Local Government Board with regard to the sufficient [illegible] of sewage may have the desired effect, and that the day is not far distant when we may all eat that delicious succulent bivalve with impunity and without that secret fear of dire consequences? Would it not have rejoiced the heart of the late Dr. Bulstrode to see that his labours were at last likely to bear fruit?

* * * *

Will it not be necessary before town planning can be carried out properly in this country to persuade the owners of land, especially the smaller owners, to see that it is in their interest to lay out the land on some larger plan than that which they think will produce the best monetary result? Will not this be exceedingly difficult in some cases where owners are only too willing to sell land to speculative builders without any restrictions? Is not the sale of land for building purposes becoming daily more difficult in the country, even in progressive suburbs?

Tiverton Rural Council's Difficulties.—Tiverton Rural District Council, owing to the difficulties of getting road materials, find themselves with an unexpended balance of over £1,000, and were on Tuesday able to set a rate of 2d. lower than the one for the corresponding half of last year. The surveyor, Mr. A. J. Mildon, said he had found it impossible to obtain a horse required for the haulage of stone.

Tar-painting of Wheel Tracks.—The Brechin District Committee of Forfarshire County Council have passed an estimate of £6,491 for road maintenance during 1915-16, and it was explained that £300 was set aside for the purpose of experimenting by tar-painting wheel tracks to a width of 4 ft. The experiments would be carried out on the Brechin, Forfar, and Lacrecrookrik roads, where there was most motor traffic. The cost would be £30 per mile.

The Use of Bituminous Material in Road Construction.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS DISCUSSION.

At last Saturday's meeting of the Institution of Municipal and County Engineers at which Mr. H. T. Welsford presided, a discussion on the use of bituminous material in road construction was opened by the president, Mr. J. S. Pickering.

The President said he would all agree that the question of bituminous material was one of the greatest importance, affecting almost any other in the case of the roads. The expression had a very wide meaning, and he thought very few of them could define what was really meant by it. Most of them, he thought, purchased their materials for road construction direct from the manufacturers, and few of them knew actually what they were getting, and he thought their knowledge in that connection would be greatly increased as a result of meetings of that kind. He hoped there was present someone whose familiarity with this complicated material was such that he could tell them something of the process of mixing with the aggregate, and exactly what tests to apply to enable them to know whether the material used was likely to be a success or not. At one time they were confined practically to crude tar, which gave indifferent results—sometimes it was a success and sometimes, for no apparent reason, a failure. Undoubtedly the composition of the tar varied very considerably according to the particular method of manufacture at the gasworks from which it was procured, but in most cases now he thought the use of crude tar had been abandoned, and other composition had taken its place. Even with distilled tar they did not appear to get the success with tar-macadamised roads they would like. Then they had the proprietary articles, which came to them under different names, but the actual composition of which they knew little. There was no doubt some of these were very valuable, and much superior to the ordinary or distilled tar. Another interesting matter was the question of the aggregate to be used in bituminous road construction. His own experience had been that limestone was preferable to granite for a sub-crust. He had had almost unvaried success with the use of tarred limestone, and had more failures where granite had been used. [The chairman: For surfacing as well.] He was speaking of the sub-crust. The road he had adopted had a foundation or sub-crust of tarred limestone, with a topping of tarred granite for the wearing surface. The tarred limestone seemed to retain its character better than granite. When a [illegible] road was broken open after [illegible] years' wear the material appeared still to possess some life, whereas tarred granite gave one the impression of having perished. Having laid many roads with the limestone sub-crust, he had come to the conclusion, [illegible] that it would take a certain amount of heavy traffic [illegible] consolidated. The best method [illegible] was to roll the [illegible] with a heavy roller, and then apply a coating of tarred granite—over the limestone. What was equally important was the after-sealing of the road, and that was a point they could not insist upon too strongly. He had used a foundation of 2½-in. gauge mixed with finer material; on top of that was ½ in. to ¾ in. of granite. That, however, was not sufficient [illegible] if a road was to last that it should be painted with some bituminous substance. What he used for the purpose was distilled tar mixed with a certain proportion of bitumen, the essential basis known as Key Compound. He [illegible] of Westrumite. That seemed a useful material, and they had covered about 10,000 sq. yds. of one of their roads with it. Westrumite was a kind of liquid asphalt with very peculiar properties. The advantage of using it was that it could be put on the road cold, and that it solidified about twelve or twenty-four [illegible] to was constructed in the manner he had described, and then painted with Westrumite, which, mixed with [illegible] forming a strong asphalt veneer. The only objection [illegible] to be that it was somewhat more slippery than an ordinary tar-painted road, but it appeared to have good wearing qualities, and its application did not depend entirely on dry weather. He had tried this material with a ½-in. carpeting, and it seemed successful. The idea of using the Westrumite was to avoid the yearly tar-painting, an offensive process—particularly in a residential town which he would be glad to see the end of. It was the painting and rolling that sealed a road, and prevented its disintegration. The Westrumite had only been down a few months, and not long enough, therefore, for him to express any opinion as to its ultimate value. Replying to the chairman, Mr. Pickering stated that he used Tytherington limestone in the system of construction he had adopted, and that where, under the previous water-bound methods, they had to resurface a road every two or three years, they had some roads which had already been down four years without any appreciable wear. The cost of surfacing with Westrumite worked out, he thought, at about 5d. per yard super.

Mr. E. Willis (who spoke on a road on which tarred slag had been put down on three successive occasions prior to his appointment), said that in each of these cases the result had been a total failure. The road, the traffic on which was now [illegible] tons a day, was about to be wood paved. He had laid a short length of Guernsey granite about five years ago, well grouted with tar after dry rolling. He then covered it with dry granite chippings, and, after tar-spraying it, put down a second coat of granite chippings. That road had not been touched since. Then he tried a short section of pitch grout, and made an excellent road, with the exception that very hot weather affected the pitch grout. Immediately adjoining he had a section of tarred granite macadam, which had been twice surface-coated since the pitch grout was put down, so that the pitch-grouted Guernsey granite had worn twice as long as the other. One thing he had found very successful was tarred clinker roads for light traffic. After scarifying, his method was to put on 4 in. of material and roll it down to 2 in. On top of this he put a coating of dry granite chippings, which seemed to fill the interstices and take up the surplus tar. Subsequent rolling produced a really excellent surface, and if he could only get enough clinker he would extend the system. Of the three kinds of coating he had experimented with—sand, shingle, and granite—granite had proved by far the best. He had abandoned the use of fine tarred granite for road surfacing. He always steam rolled [illegible] surfacing or spraying.

Mr. J. A. Webb (Hendon): Do you find your pitch-grouted road move in the hot weather?

Mr. Willis: Yes, the pitch creeps slightly; but I then add [illegible] granite chips.

Mr. E. J. Elford (Southend): I see, and he had seen clinker tar-macadam at Leicester a year or two ago; could Mr. Willis say anything about the mixing with the tar?

Mr. Willis: It uses a fair amount of tar, but it leaves no tar on the top, as this is all taken up by the dry granite chippings.

The President: Yes, that is so; it takes about 20 [illegible] per yard cube.

Mr. Elford remarked that at Southend the effect of 16 gallons to the yard cube was not satisfactory and his people got rather frightened.

Mr. Willis said he bought his material from the destructor department, and paid 7s. 6d. per yard cube [illegible]. For [illegible] year he paid per gallon [illegible] for the coming year the Road Board specification was somewhat less.

Mr. E. J. Lemon (Southend-on-Sea) said he had been experimenting with clinker tar-macadam, and [illegible] clinker on this material at any rate for the foundation coat. He had some trouble last year with slag tar-macadam, and thought manufacturers had great difficulty in keeping up the standard towards the end of the season owing to the heavy demand. He used over 10,000 tons during the year, and the proportion of failures was small; but they were annoying, and he should like to know the reason. He specified that the materials should be mixed twice—that was to say, mixed, and allowed to mature, and then mixed again. He thought this was

The Surveyor
and Municipal and County Engineer.

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a large-gauge material, and attempted to fill up the interstices afterwards. He had tried a number of proprietary articles, but he confessed he often got a

almost all stones fit for road making—granite, at any rate—were practically non-porous and dry immediately upon crushing. His experience had been that a very fine light powder gave the best results as a filler, and he had found hot coal tar Portland cement or grouting quicklime convenient. With regard to granite, iron slag and limestone, so far as he could see, he got equally good results from all three, but he had had more failures with tarred granite than the others. However, since he had adopted the system of grouting up the interstices between the stones with hot sand and cement or lime, he had had no trouble. As to tar, he thought all who had gasworks in their neighbourhood ought to try and encourage the gas companies to prepare the tar with a special view to its use for roads. They should insist on the distillation going on until the creosote was to some extent removed and the anthracene was just being reached; if they went beyond that point and got to the pitch they would have trouble. Everything depended on the anthracene, and once that was gone they were not going to get good tar. As to the grouting, he agreed with Mr. Elford that one of the troubles of the system was the possibility of a shower of rain coming on just as one was about to commence grouting operations. He had had failures for this reason. Apart from this he thought it was the best of all systems for making bituminous roads. Mr. Collins went on to speak in

heating of stone as of great importance. It was absolutely essential that the stone should be dry. Practically almost all stones fit for road making—granite, at any rate—were practically non-porous and dry immediately upon crushing. His experience had been that a very fine light powder gave the best results as a filler, and he had found hot coal tar Portland cement or grouting quicklime convenient. With regard to granite, iron slag and limestone, so far as he could see, he got equally good results from all three, but he had had more failures with tarred granite than the others. However, since he had adopted the system of grouting up the interstices between the stones with hot sand and cement or lime, he had had no trouble. As to tar, he thought all who had gasworks in their neighbourhood ought to try and encourage the gas companies to prepare the tar with a special view to its use for roads. They should insist on the distillation going on until the creosote was to some extent removed and the anthracene was just being reached; if they went beyond that point and got to the pitch they would have trouble. Everything depended on the anthracene, and once that was gone they were not going to get good tar. As to the grouting, he agreed with Mr. Elford that one of the troubles of the system was the possibility of a shower of rain coming on just as one was about to commence grouting operations. He had had failures for this reason. Apart from this he thought it was the best of all systems for making bituminous roads. Mr. Collins went on to speak in

painting of ordinary water-bound macadam. His best results in this connection had, he said, been obtained by employing water-gas tar poured on hot, an application of hot distilled tar. Tar-painting for the quality of tar was likely to mislead unless accompanied by other tests.

Mr. J. W. [illegible] heavy traffic, which had been down in his town for the past twenty years, and which was not yet worn 8-in. concrete foundation, and the blocks, which were 4 in. in depth, were laid with a narrow joint. Jarrah was then cheaper than was now the case, and he was able to buy the blocks at the price of 7s. 8d. per yard that a considerable quantity had been laid, and more than ten years ago he reported to his council that this adam. Afterwards he experimented with bituminous and in 1914 30,000 yds., and carried out the work entirely without outside assistance, at a cost of 4s. 2d. per yard. Guernsey granite was bought at 9s. 6d. to him 7l. per ton. Mr. Cockrill concluded his remarks with some particulars of bitumen grouting which he has carried out in Great Yarmouth.

The discussion was adjourned until April 10th.

THE SHORTAGE OF LABOUR.

LOCAL GOVERNMENT BOARD'S CIRCULAR TO LOCAL AUTHORITIES.

rities the Local Government Board state that they have received from the Committee of Imperial Defence a communication in regard to the organisation of the labour force of the country in the present circumstances. In view of the needs of recruiting, and of the demand for labour for the manufacture of war materials, and for the production and transport of the necessary supplies for the population, the Committee [illegible] of releasing male labour of high physical quality, so stituting, where necessary, men of more advanced years, or, where the conditions allow, women workers.

The board are aware that local authorities generally have done much to facilitate the enlistment of those of their employees who are eligible for military service and who can be spared, and they are far from suggesting that the normal staffs should be depleted to such a degree that the services for which the local authorities are responsible could no longer be carried on with efficiency; but at a time when the vital interests of the country imperatively require that as many fit men as possible should be added to the Army, pered by lack of labour, and when the same cause gives rise to difficulties in the supply and transport of food, fuel, and other necessaries—difficulties which have largely contributed to the recent increase in prices—the Government are compelled to remind the local authorities of the importance of making adequate arrangements for utilising to the best advantage the available supply of labour. They would urge that only men who are indispensable for the work of the local authority should be refused permission to enlist; that artisans who belong to trades needed in the wherever possible, be released and encouraged to find employment there; and that where there is a demand for labourers on the railways, in the docks, and on farms, the local authority should facilitate the transfer to those employments of any men who can be spared, and who can there find suitable occupation and remuneration. In pursuance of this policy it will, the board point out, be necessary to economise labour to the greatest extent possible, and, where substitutes are needed, to engage only men who are not eligible for the Army and not suited for the occupations to which labour should be transferred. There

are some posts in which the employment temporarily of women in place of men may be practicable.

"At the outset of the war," the board proceed, "there was reason to fear that unemployment might be widespread. The Government Committee on the Prevention and Relief of Distress suggested to local authorities that they should have in readiness schemes for new works and buildings which could be put into operation in case serious unemployment should arise. Local authorities have in general responded to this suggestion, and in most cases such schemes are ready or in an advanced stage of preparation. Happily, however, after the first few weeks, the trade of the country recovered from its dislocation, and the enlistment of large numbers of men and the execution of war contracts have, in most districts, converted the problem to be faced from one of unemployment to one of shortage of labour. In these circumstances an opposite policy is indicated, and it becomes necessary to avoid the inception of all new works, except such as are of pressing necessity either for reasons of public health or on account of war requirements.

"Moreover, it is essential to see that capital as well as labour is made available in the directions in which it can best further the national interests during the war, and, as you are no doubt aware, the Lords Commissioners of His Majesty's Treasury have decided to restrict capital issues by local authorities, as well as by public companies, within the narrowest limits. After the termination of the war, when the men return from the Army and when the war contracts cease, it is possible that the question of unemployment may again become acute. The schemes for new works and buildings, which have been or are being prepared, would then be of the greatest value, and undertakings which are now reluctantly postponed owing to the need of economising both capital and labour could then be carried into effect with double advantage."

The board enclose with their circular a copy of the memorandum entitled "Officers of Local Authorities on Naval or Military Service," which they issued on August 21st last. In that memorandum the board indicated their view that local authorities might properly keep open the places of officers in their employment who joined His Majesty's Forces with their permission, and the board think that a similar view might, if the local authority were willing, apply to those persons in their employment who, in the present emergency, enter other employments. The board are aware that the policy which, in accordance with the conclusions of the Committee of Imperial Defence, they recommend may involve the employment by local authorities of less efficient labour, the postponement of many desirable works, and some public inconvenience; but they have no doubt that the difficulties will be faced and the inconvenience cheerfully borne in view of the needs of the time and the gravity of the issues at stake.

LOCAL AUTHORITIES' DIFFICULTIES

Local authorities, states the *Times*, are undoing difficulties in the way of complying with the request of the Local Government Board that they should release from municipal work men suitable for enlistment and for work in arsenals, dockyards, and armament factories. The chief complaint is that no definite plan for the suggested transfer of labour is set out in the Government circular, and that, anxious as the authorities are to assist the Government, there is likely to be a considerable wastage unless some machinery is provided to ensure the right men being drafted to the right places.

Already many municipalities are working with reduced staffs, and the quinquennial valuation, which will begin next month, will put further pressure on them. There are many departments of municipal work in which skilled men are engaged which must be carried on, and for which only expert workers are fitted. Chief of these are the electrical power stations and drainage and water works. Many municipalities, besides producing electricity for their own requirements, are under contract to supply manufacturers. Some of the men now engaged in street cleaning and the removal of house refuse could be spared, but any reduction of this work on a large scale would seriously interfere with public health.

ROAD BOARD CIRCULARS.

Surveyors to all local authorities having Road Board works in hand have received the following circular from the board's manager and engineer, Mr. H. P. Maybury, M.Inst.C.E.:

"I beg to refer to the above-mentioned proposal, and to say that the Road Board would be glad to know whether it would be possible for your council to defer proceeding with the scheme until more normal conditions obtain.

"At present the demand for labour and materials for urgent national requirements is such that it is extremely undesirable for highway authorities to press forward any schemes which could well be postponed, even though such postponement causes some local inconvenience.

"The policy on which the board are acting at the present time is based on the need of economising public expenditure, and of deferring works of road improvement except in cases where the work is necessary to prevent serious deterioration.

"From the information before the board it would appear that the proposal referred to—or, at least, portions thereof—might conveniently be postponed, and I am directed to ask your council to consider the advisability of taking this course.

"Your council will readily appreciate the necessity for conserving the resources of capital and labour, both of which are urgently needed for national purposes, and I am directed to say that, in the event of your council now having men engaged upon works which could properly be deferred, the board would be glad to avail themselves of the services of such men upon important road works which are being carried out in and around new military camps, for which a supply of men is now rather urgently required.

"I shall be happy to send you terms and conditions of employment if your council are in a position to render assistance.—Yours faithfully,

"H. P. Maybury."

The subjoined circular has been addressed to county surveyors in England, and to certain of those officials in Wales; also to most of the county and metropolitan boroughs:

ROAD IMPROVEMENT WORK FOR MILITARY PURPOSES

"Sir,—I am directed by the Road Board to submit a request for some assistance towards providing men required for some rather urgent road work.

"The board are engaged in arranging with various highway authorities for road work required in connection with military traffic, and, owing to shortage of labour, progress is slower than it ought to be.

"It has occurred to them that there are many districts in which men are employed upon works which, although of some importance, are not so urgent as the other works to which I have referred.

"Accordingly I am directed to ask your council whether they would agree to assist the road work for the military authorities by placing at the board's disposal, for temporary service in the southern and eastern counties, good workmen who are now in their employment.

"Such men would be well paid for their services (about 6d. per hour), and [illegible] accommodation with blankets and rugs, would be provided free. Railway fares would be paid to the scene of operations, and also return fares to those who return to their present employment.

"It would be convenient if such men as you were able to send were accompanied by a foreman, under whose directions they would work, and, as far as practicable, arrangements would be made for gangs so formed to be employed and housed together.

"The board will be glad if you will kindly deal with this request immediately, and advise me, on or before the 20th inst., how many men your council can spare for the work mentioned. I am, Sir, your obedient servant,

"H. P. Maybury."

In answer to a question why the steam roller had been idle, the surveyor to the Eastbourne Rural District Council, Mr. C. M. Carter, stated that the driver had been ill and he had been unable to get another. He was open to pay 10s. a day. He could get one. He asked a tradesman if he could send a driver, and the tradesman replied that he had only got one man to two engines.

Waterproofing of Flat Roofs.—There [illegible] many [illegible] flat roofs [illegible] and many of these are made watertight with a rendering of Pudlo and cement. A large flat erected at Blackpool (Shaw's depository) was finished about [illegible] months ago, and we understand that both contractor and architect consider the Pudlo treatment a great success.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, A.M.I.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

460. Sewage Sea Outfall. [illegible] pipes better than [illegible] pipes? [illegible] sewage outfall into the sea which is covered at high water. Can [illegible] regard [illegible] expense and [illegible] (J. R. H. *Ipswich.*)

463. Bomb-proof Dug-out. [illegible] bomb-proof dug-out to hold five people. (E. [illegible])

465. Girder Design. What are the main points to be borne in mind when determining the [illegible] purpose of [illegible] type of girder, the proportions of girder (depth and width, &c.), (c) material to be employed (steel, wrought iron or [illegible]? (M. T. R. *Rhyl.*)

466. Road Making. [illegible] road will enable an engineer to [illegible] the builder and [illegible] a [illegible] macadam road. (*Essex.*)

467. Destructors Forced Draught.—Discuss the [illegible] forced blast in destructors. (*Essex.*)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

464. Masonry Arch. State [illegible] masonry arch may fail, and describe [illegible] (J. H. *Barbados.*)

A masonry arch may fail in [illegible] the [illegible] through the crushing of the [illegible] stress in any section of the arch ring exceeds the crushing strength of the material. The thrust in an arch is a maximum when the arch is fully loaded over the whole span, and the thrust is a minimum when the [illegible] the arch ring. The danger of failure through crushing can be obviated by adjusting the depth of the arch ring [illegible] that the sectional area of all portions of the latter is proportional to the thrust, and so [illegible] that the safe compressive stress of the masonry is not exceeded. Arches of small span are seldom designed from first principles, since they are repetitions of examples of well-established proportions, the arch thickness being determined from empirical rules. They often have a large margin of safety, and are of uniform depth throughout. Arches of larger span (80 ft. and upwards) are designed more in accordance with economic principles, the depth of the arch ring varying from a maximum at the springings to a minimum at the crown. A large factor of safety is necessary when determining the safe compression, in order to provide for variations in the strength of the material as well as for other contingencies. The factor of safety should not be less than eight, according to Rankine. The great weight of masonry required in comparison with the safe compressive stress employed in design, and the heavy centering that must be provided when dealing with arches of large dimensions, limits the useful span to 300 ft., or thereabouts. Examples: Pont Adolphe at Luxembourg, span 277 ft. 9 in. Rise 101 ft. 6 in. Thickness at crown: 4 ft. 8½ in., maximum thickness: 7 ft. 10 in. Grosvenor Bridge, Chester: Span 200 ft. Rise 42 ft. Thickness at crown: 4 ft.; thickness at springings, 6 ft. Second: By shearing of the masonry. As in beams and girders when the arch carries its full load, particularly if the arch be flat, the shear stress at the springings may exceed the shear strength of the masonry. The arch ring must [illegible] stress induced under full load is not greater than the safe shear for the masonry. Third: By rotation. [illegible] is carried out on the principle that no tension should occur in any part of the arch ring under any probable loads that the arch may be expected to take. This condition is fulfilled if the "curve [illegible] sometimes named, lies within the middle third of the arch thickness under any probable loading. When testing the liability of failure by rotation it is advisable to draw the "curve of least resistance" for the arch when the dead load is assumed to [illegible] carrying the live load in addition. Should the "linear arch" or "curve of least resistance" lie within the middle third under this loading, we know that no tension exists in any portion of the arch ring. Should the "curve of least resistance" deviate from the prescribed limits, then the thickness of the arch ring must be modified in such a way that the condition enunciated previously is fulfilled at all points. In discussing the above types of failure, we have assumed that the abutments are unyielding. Should this not be the case the arch cannot fulfil the function of an arch, but is in reality a curved beam; bending stresses would be induced, and failure might possibly occur under dead load only. (M. T. R., *Rhyl.*)

The three most important ways in which a masonry arch may fail are as follows: (1) By the crushing of the voussoirs; (2) by the sliding of the voussoirs one over the other; (3) by the rotation or tilting of the voussoirs. The first of the above is caused when the compressive stress due to the load exceeds the safe compressive stress for the material of which the arch is composed, and is avoided by making the sectional area or depth of the voussoirs [illegible] $= \frac{T}{f}$ [illegible] stress, where T is the thrust on any joint per unit width and d is the depth of the voussoir. The second method of failure is caused by the resultant line of thrust making too great an angle with the normal to the joint, and is obviated by so arranging the joints that the resultant line of thrust at any point does not make an angle with the normal to the joint greater than the friction angle.

The last-mentioned method of failure can only occur when the resultant line of thrust passes outside the section altogether. If this is the case, tilting of the voussoirs will ensue until the resultant line of thrust passes through the pivoting points. Arches cannot fail from this cause if designed in such a manner that their resultant line of thrust lies within the limits of the middle third throughout [illegible] (E. K. *Newport, M.*)

The successful design of a masonry arch is based [illegible] By Crushing: If the arch is too flat for the load and size of ring stones, the thrust in the arch may be too great for the material; thus the pressure intensity must at no point exceed that which is safe for the material. [illegible] By Sliding or Shearing. The [illegible] must be within the limiting angle of resistance to [illegible] By Overturning. At any point of section the resultant thrust from left to right, or *vice versâ*, can be represented in magnitude, direction and position by some line. If we join up by a curve all points in the various sections from abutment to abutment, where such lines intersect the sections, we obtain the "line of resistance." If this line passes through the middle of the section [illegible] passes too near the top we get excessive compression at the top of the joint and a tendency to open at

the bottom. Failure in this manner [illegible] overturning. In rectangular sections, if the resultant zero is one-sixth the width of section from the centre then there [illegible] and double the mean stress at the other edge of section; if we can be sure of only that the resultant is in the middle third [illegible] the edge at that section. It follows that, if we cannot rely on the material standing tension, we should be able to draw the line of resistance entirely within the middle third. [illegible] E. M. *Framlingham.*

NOTES.

The following printer's errors occur in the reply to Question 461 published in the issue of March 6th:—

Example No. 1, p. 359, line 5, should read

(Moment of inertia about axis XX of strip parallel to XX passing through A. Product of area of strip and the centre of gravity of strip from axis XX.

Example No. 1, p. 359, line 12, should read

∴ Moment of inertia of [illegible]

BUSINESS ANNOUNCEMENTS.

At the request of Messrs. F. Hill and G. Hodge, the partnership lately existing between themselves and W. Manders, trading as W. Manders & Co., of Leyton, has been dissolved by mutual consent, and in future the business will be carried on by the contracting world, Messrs. Hill and Hodge are commencing business as public works contractors under the style of The Municipal Contracting and Engineering Company. Since the early part of 1912 they have tendered for and carried out the whole of the contracts obtained by Manders & Co., Mr. Manders having been absent in Canada.

We are informed that the (U.K.) Winget Concrete Machine Company, Limited, have decided to shorten the name of the company to Winget, Limited, and that they have taken new [illegible] London offices at 25 Victoria-street, Westminster, S.W. The head office [illegible] Newcastle-on-Tyne.

Tanks, Cylinders and Cisterns.—W. P. Butterfield, Limited, Shipley, Yorks, announce that, owing to the cost of raw material and labour, all their lists and discounts are withdrawn.

THE WAR AND THE ROADS.

LORD KITCHENER'S REPLY TO RURAL COUNCIL.

The Faversham Rural District Council have been making representations to the War Office in respect of damage caused to roads in the district owing to the consignment on the extraordinary traffic for military purposes.

An engineering expert [illegible] to inspect the roads affected, and it appears that the War Secretary does not appear [illegible] damage caused by such traffic. [illegible] the Council [illegible] the local authorities should [illegible] from patriotic motives and [illegible] fact that a district council [illegible]

Sidmouth Town Planning.—It is understood that the Local Government Board have approved for the preparation of a town planning scheme under the Housing and Town Planning Act, 1909, by the Urban District Council. [illegible] the area affected [illegible]

Maldens and Coombe Sewage Works Extensions.—At the last meeting of the Maldens and Coombe Urban District Council, Mr. E. Lovell, the surveyor, reported that the extensions to the sewage disposal works had been completed, the total cost, after allowing for clinker, cartage of clinker, and sprinklers, being £364 below the contract sum of £1,124. Deducting £364 from £1,151 had left a balance in the hands of the contractors of £787, which had been paid to them, leaving a net saving of £23. The committee considered that was very satisfactory, and congratulated the surveyor on having the work completed [illegible] was agreed that arrangements should be made for a formal opening of the extension works at an early date.

CORRESPONDENCE.

The Editor is not responsible for the views expressed by his correspondents.

ELEPHANTS FOR ROAD MAKING.

To the Editor of THE SURVEYOR.

Sir,—We note [illegible] reference to the use of elephants for road making [illegible] Yes, we have [illegible] the elephant [illegible] pull [illegible] to [illegible] "Yours, &c.,

MARSHALL SONS & CO. LTD.

Gainsborough.

WIND PRESSURE.

To the Editor of THE SURVEYOR.

Sir,—The article [illegible] "Some Notes on Wind Pressure," by Mr. Graham Keevil, which you publish in your issue of the 12th inst., reminds me of an experience of mine when borough engineer of Penzance [illegible] A section of the [illegible] force, but only about 100 yds. in width, swept down [illegible] amount of damage, especially in one of the public parks. A solid monolith granite obelisk was turned over on its base, and fell to the ground uninjured. It was an easy calculation to make as to what force had been applied to effect this reversal, and if my [illegible] to effect this amounted to the very large amount of 90 lb. on the square foot. This, of course, is, fortunately, very exceptional in this country, but I give it as an instance of how the wind can sometimes not [illegible] Yours &c.,

H. [illegible]

7, [illegible] S.W.

Road Improvement in Armagh.—The county surveyor of Armagh, Mr. R. H. Dobbs, in his report after alluding to the condition of the roads in the Armagh and Lurgan rural districts proceeded to point out that there are three ways by which additional material might be [illegible] any increase in local taxation, namely, by obtaining grants from the Road Board, by borrowing money, or by taking a percentage of the [illegible] and by increasing the efficiency of the [illegible] Road Board were prepared to approve of any well-considered proposals for the improvement of the leading roads (not necessarily trunk roads) of the county, and when it was so evident that, owing to the [illegible] these roads could not be maintained in a satisfactory condition at present cost he did not understand why the district councils did not [illegible] the largest possible grants from the Board. He suggested the appointment of a committee to meet at works to be [illegible] Road Board works which they were in progress during the summer.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Colwyn Bay U.D.C. (March 4th. Mr. F. G. Stanford).—£25,000 for the erection of a destructor and an electric generating station. The engineer, Mr. William Jones, explained the object of the application with respect to the destructor, and as regards the proposed loan for generating plant it was explained that [illegible] being run with absolutely no [illegible] plant.

Doncaster R.D.C. (March 4th. Mr. P. M. Crawthorn).—£2,000 for the purpose of [illegible] the construction of Victoria Dock. Mr. F. W. Marshall explained that the [illegible] and £50 was [illegible] 3,140. It was estimated that the ultimate population of the parish would be [illegible] and 20 gallons per head a daily supply [illegible] required. It was proposed [illegible] hall [illegible] (Limited).

Dungannon U.D.C. and R.D.C. (March 2nd. Mr. P. C. Cowan). [illegible] by the urban and rural [illegible] Order empowering [illegible] for the purpose of improving the water supply to the Dungannon and [illegible] works. The [illegible] to be £19,000, [illegible] passed and [illegible] supply and £2,000 [illegible]

Plymouth T.C. [illegible] by the Devonport [illegible] meeting. It was explained that the [illegible] corporation asked that the applications should not be refused, but that [illegible] to the Local Government Board, [illegible] deprived of the [illegible] which they [illegible] troops, guns, and munitions of war, it was extremely important that the Devonport roads should be wide and sound. The majority of the applications relating to thoroughfares in Devonport [illegible] of the road leading to Naval [illegible] The borough surveyor, Mr. J. Paton, said that buildings were in course of erection and would probably be completed within nine months' time.

Rotherham R.D.C. (March 5th. Mr. P. M. Crawthorn).—£492 for water [illegible] Wickersley. Evidence was given by Mr. B. Hey, the clerk, Mr. J. H. Pickford, and others. The council were [illegible] felt it imperative to construct the sewer before receiving the sanction of the Local Government Board, because the health of the children attending the school was likely to be endangered, and the conditions were becoming so bad that it was absolutely necessary to proceed with the work.

Settle R.D.C. (March 4th. Mr. A. W. Brightmore).—£3,000 for a [illegible] water supply to [illegible] cost, of £2,150. [illegible] constructed, and there have been several extensions of mains recently [illegible] ment of the new Ingleton Colliery and the erection of a model village [illegible] increased supply, and [illegible] make provision for Chapel-le-Dale.

APPLICATIONS FOR LOANS.

Ashton-under-Lyne T.C. £293 for [illegible] improvement.

Bexley U.D.C. £[illegible] for the East Wickham sewerage scheme.

Billericay R.D.C.—£800 for sewerage works at Hutton.

Cannock U.D.C.—£10,675 for the erection of forty-four houses.

Chesterton R.D.C. £[illegible] for road purposes.

Dorset C.C. £900 for the erection of two cottages at Buckland Newton.

Haywards Heath U.D.C. £250 for [illegible] road.

Kingston-on-Thames T.C. £[illegible] [illegible] roller-skating.

Reading T.C.—£2,415 for street widenings.

Richmond (Surrey) T.C.—£977 for widening and [illegible]

St. Germans R.D.C.—£200, additional loan for the St. Germans Village water supply.

Seaford U.D.C.—£800 for the drainage of the Northern camp.

Widnes T.C. [illegible] purposes of a [illegible] torium.

LOANS SANCTIONED.

Barnes U.D.C.—£2,900 for the High-street improvement.

Hexham R.D.C. £500 for works of water supply.

Heywood R.D.C. [illegible] for waterworks [illegible]

Penzance T.C. £600 for converting part of the [illegible]

Sheffield T.C. £21,680 for the erection of baths at Hillsbrough and Wincobank, washhouses at Danielhall, and a central laundry near Penistone-road.

Torquay T.C. [illegible]

FORTHCOMING INQUIRIES.

MARCH £

22. **Leicester.** For street improvement and [illegible] (Mr. H. Bennett) ... £811
22. **Margam.** For the provision of working-[illegible] (Mr. H. [illegible]) 1,400
23. **Puncorn.** [illegible] (Mr. J. H. Talbot) 1,931
23. **Spalding.** For the provision of working-class houses (Mr. W. H. Collin) ... 1,515
[illegible] **Stone.** [illegible] (Mr. [illegible]) [illegible]
[illegible] **Boston.** [illegible] destructor (Mr. R. H. Bicknell) ... 3,600
[illegible] **Burnley.** [illegible] disposal (Mr. [illegible]) 23,000
24. **Swansea.** For road widening and [illegible] (Mr. W. O. [illegible]) 2,200
24. **Worcester.** For works of water supply (Mr. A. W. [illegible]) 9,875
25. **New Mill.** For works of water supply (Mr. [illegible])
[illegible] **Pontardawe.** [illegible] supply (Mr. W. O. [illegible]) 2,473

[illegible] [illegible]

[illegible] **Birmingham** (Mr. [illegible])

APRIL

13. **Southend** (Mr. George L. Pepler) ... —

Strike of Dundee Street Cleaners. The outdoor staff of the Dundee cleansing department have struck for higher wages, and the streets are beginning to have a neglected and untidy appearance. On Monday four of the foremen, escorted by a strong force of police, [illegible] thoroughfares of the latter which had accumulated for several days. Meanwhile the domestic refuse remains uncollected.

Ballymena Rural Council and their Engineer.—[illegible] to the engineer of the [illegible] respectable instance of [illegible] The road council are [illegible] It [illegible] Mr. Getty, [illegible] reasonably as [illegible] the performance of the [illegible] and in the event of the [illegible] entered into him by the contract. A [illegible] expected the pipe along the pipe line, and made a report "that they were unanimously [illegible] which was at a deadlock, [illegible] amazing report was adopted [illegible] to the contractor [illegible] at once." The [illegible] proceed not merely to [illegible] but to [illegible] and pass [illegible] and severely condemned.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Ilford £6,000, Ossett £10,000; housing and town planning—Walsall; roads and materials—Fraserburgh, Islington, Lichfield; sewerage and sewage disposal Bexley, Redruth; water, gas and electricity—Fifeshire, Poole, Windsor; miscellaneous—Bolsover. Particulars of other projected works will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Aberdeenshire C.C. Failing a grant from the Road Board for the purpose, the County Road Board recommend the county council to give consent to the Alford District Committee to proceed with the erection of a bridge at Drumallochie, at an estimated cost of £1,675.

Gravesend T.C.—The question is under consideration of building an additional isolation hospital.

Grimsby T.C.—An estimate of £300 has been passed for a five-stall extension of the municipal stables and the provision of a harness-room.

Hants C.C.—The Public Health Committee have been authorised to prepare plans for the provision of a combined sanatorium and hospital.

Ilford U.D.C.—A central library is to be built in Oakfield-road, at an estimated cost of £6,000.

Leyburn R.D.C.—The council are considering the question of building an isolation hospital.

Long Eaton U.D.C.—The council have approved plans for an open-air swimming bath to be constructed in West Park, at an estimated cost of £1,750.

Lowestoft T.C.—In accordance with the amended scheme of sea defence prepared by the borough surveyor, Mr. G. W. Hamby, the council have decided to carry out the following works—viz.: North Beach—A Groyne (sixteen bays), £1,540; B Groyne (ten bays), £912; total £2,452. South Beach—A Groyne (eleven bays), £951; Spur Groyne to do (twelve bays), £675; E Groyne (four bays), £242; G Groyne (three bays), £187; J Groyne (three bays), £214; M Groyne (ten bays), £573; South Pier Spur Groyne (twenty-nine bays), £2,063; total £4,905.

Ossett T.C.—A scheme has been approved for the erection of a new school at Gawthorpe, at an estimated cost of £10,000.

Sheffield T.C.—The Local Government Board have given consent to the corporation proposal to erect shops in connection with the new offices of the Electric Light Department in Bow-street, and the committee recommend the council to make application to the Local Government Board for their formal approval to the land being used for the purpose named.

Shropshire C.C. Sites are to be purchased at Hadley and Shrewsbury for an isolation hospital.

Wimbledon T.C.—The borough engineer, Mr. C. H. Cooper, has received instructions to prepare an estimate for the provision of accommodation for the hospital staff.

HOUSING AND TOWN PLANNING.

Altrincham U.D.C.—Negotiations are proceeding for the purchase of 10 acres for the purposes of a housing scheme.

Barry U.D.C.—The Housing and Town Planning Committee have been instructed to consider the question of building more working-class houses.

Lichfield T.C.—Plans for twenty working-class houses have been forwarded to the Local Government Board for approval.

Walsall T.C.—The Health Committee have been asked to submit a report upon the provision of working-class dwellings.

REFUSE COLLECTION AND DISPOSAL.

Bettws-y-Coed U.D.C.—The surveyor, Mr. W. O. Hughes, has received instructions to prepare an estimate of a direct system of house refuse removal.

Isle of Thanet R.D.C.—The sanitary inspector, Mr. Connor, has prepared a new scheme for the scavenging of Birchington and Westgate-on-Sea.

Sheffield T.C.—The efficiency of the cleansing department is threatened owing to the enlistment of employees, 131 having joined to date. Hence the decision that no allowance shall be granted in respect of men engaged in the work of refuse disposal who enlist in future without the consent of the Cleansing Sub-Committee.

ROADS AND MATERIALS.

Aldershot U.D.C.—The Highways Committee, in presenting their estimate for the half-year, reported that they considered it advisable to use granite on the roads instead of gravel. Included in the requisitions was an estimate by the surveyor, Mr. F. C. Uren, for a machine for drying roads before the application of Tarmac.—It was decided to effect an improvement in Newport-road at an estimated cost of £700.

Carlisle T.C.—The Health Committee last week considered the Road Board's reply to their application in connection with the scheme for the improvement of practically all the main roads in the city, at an estimated cost of £15,000. The board stated that they were not prepared to consider the proposals, except in the event of urgent need arising owing to unemployment. It was stated by the mayor, Mr. F. P. Dixon, that there was practically no unemployment in the city, and the scheme was remitted to the Works Committee.

Colchester T.C. The council have resolved to comply with the request of the military authorities, conveyed through the Road Board, to carry out improvement works on the track leading from Layer-road to Reed Hall, and on a portion of the occupation road on Severalls Asylum ground, and the borough surveyor, Mr. H. Collins, has received instructions to invite tenders for the work subject to the Road Board approving the estimate.

Epsom U.D.C.—Draft estimates for road repairs at an estimated cost of £1,837 have been approved by the council.

Farnborough U.D.C.—Tar-spraying is to be carried out on a number of roads during the summer at an estimated cost of £350.

Finsbury T.C.—In connection with the proposal to repave portions of the carriageway of Northampton-square, a letter has been received from the Roadamant Company, Limited, by whom the paving with roadamant of certain sections of the carriageway, of an area of 592 sup. yds., was completed in May, 1912, and is still being maintained free of charge, suggesting that the necessity for their frequent repair arises from water getting under the material, and that the consequent inconvenience both to the council and themselves would be obviated if the area of the paving were extended. They offered to take up and relay, free of charge, the whole of the existing roadamant paving, and at 5s. 2d. per yard super. to pave with roadamant on the foundation to be prepared by the council the area (approximately 708 super. yds.). The council have agreed that the area should be repaved, the old portion as relaid to be maintained by the company free of cost until May, 1917, and the new work likewise maintained for five years from the date of its completion.

Fraserburgh T.C.—Negotiations are proceeding for the construction of an esplanade at the beach at an estimated cost of £10,355.

Harrogate T.C.—Akonia is again to be used for dust prevention this season at Harrogate.

Ilfracombe U.D.C.—The Local Government Board, in reference to the application for a loan of £630 for the High-street improvement, has written that the present time is not opportune for granting additional loans, and they did not think they could properly sanction a loan now.

Ipswich T.C.—Repairs are to be carried out in Carr-street at an estimated cost of £200.

Islington B.C.—An estimate of £26,942 has been agreed to for repaving the whole of Liverpool-road with granite setts and application is to be made to the London County Council for sanction to borrow that amount, less the amount of their contribution.

Lichfield T.C.—Strengthening and resurfacing works are to be carried out in Tamworth-road at an estimated cost of £1,516.

Marylebone B.C. It has been agreed that wood paving, in substitution for granite pitching, should be laid in the portions of the carriageways of Richmond street and Salisbury street in front of Richmond street school's, at a cost of £290. The tender of the Trinidad Lake Asphalt Paving Company, Limited, has been accepted for laying bituminous paving in the carriageway of Grove-road (from railway bridge to St. John's Wood-road) at the price of 11s. 10d. per square yard to include free maintenance for a period of eight years, and the maintenance for a further two years at the rate of 9d. per square yard per annum.

Reading T.C.—The tender of Messrs. Frank Hare & Brothers, at £1,531, has been accepted for private street improvement in Warren-road, and the borough surveyor, Mr. J. Bowen, has received instructions to submit plans, sections, and estimate of the cost of making up Allcroft road a private street.—A number of sites in Basingstoke-road, Lower Thorn-street, and Butter Market are to be purchased for the purpose of street widenings.

Richmond (Surrey) T.C.—The tenders of Messrs. E. Parry & Co., of Putney, at £305 and £182 respectively, have been accepted for making up Nightingale road and part of Chilton road.

Rugby R.D.C. The council have adopted a recommendation of the Highway Committee that in view of the increased price of stone instead of purchasing 3,000 tons of stone of a superior quality for use on the roads having the heaviest traffic, 1,000 tons only of best stone be purchased from the Mountsorrel Granite Company, leaving a balance, as estimated by the surveyor, of 6,000 tons of stone of a cheaper quality and 1,200 tons of chippings and binding, for which the council have accepted the tender of Messrs. Judkins. This was an increase on previous years, but the surveyor was unable to recommend any reduction.—For carting the stone the committee recommended the acceptance of tenders, which, in a number of instances, varied from 1d. to 2d. per ton increase on last year's prices.

Salford T.C.—The Improvements Committee, accompanied by the borough engineer, Mr. Ernest B. Martin, has been engaged recently in visiting sites in Regent-road, Charles-street, and Whit-lane, with a view to effecting prospective road widenings and improvement.

Salisbury T.C.—The city surveyor, Mr. W. J. Goodwin, has received instructions to prepare a scheme for widening Castle-road to 50 ft.

Sheffield T.C.—Official sanction has been given for the corporation to amend the Act of 1890 so as to allow them to contribute towards private street works.

Wandsworth B.C. An arrangement has been reached between the borough council and the county council with regard to the widening of High-street, Wandsworth. The road is to be widened to 60 ft., and a strip of the town hall site, varying from 15 ft. 5 in. to 5 ft. 1 in., will be required.

Whitby R.D.C.—The surveyor, Mr. J. Emerson, has prepared a scheme for the better organisation of labour, and the working of the quarries under his control, involving a considerable saving annually.

SEWERAGE AND SEWAGE DISPOSAL.

Bexley U.D.C.—Messrs. Strachan & Weekes' estimate of £1,685 for the sewerage of that portion of the low-lying area of the East Wickham Ward to the north-east of Edison-road included 15 per cent for engineering and contingencies, and £180 for the extension of the sewer to take in property at Hills Grove. The council have decided to accept Messrs. Strachan & Weekes' terms for supervision of the work, and to make application to the Local Government Board for sanction for a loan.

Birstall U.D.C.—It was reported to the council recently that good progress was being made in the conversion of old privies to the water-carriage system.

Farnborough U.D.C.—The surveyor, Mr. J. E. Hargreaves, has received instructions to carry out sewerage works in Fimgrove-road and a portion of Hillfield-road.

Redruth R.D.C.—The council have adopted a resolution expressing willingness to join the Redruth Urban Council in the construction of a tunnel for the carriage of the sewerage of Illogan and Redruth to the sea, the cost of the tunnel to be apportioned between the respective councils.

WATER, GAS, AND ELECTRICITY.

Atcham R.D.C. The surveyor, Mr. H. Asbee, has [illegible] to prepare a scheme for the [illegible] to supply the parish of Cressage with water from the Local Government Board reservoir.

Fifeshire C.C.—With regard to schemes under consideration for improving the water supply of Upper and Lower Largo, the St. Andrews District Committee have resolved not to carry out any of these in the meantime, but it was agreed to raise the sill of the present reservoir 1 ft., which will provide nearly 1,000,000 gallons extra at the cost of a few pounds.

Holywell R.D.C.—With reference to the proposed water supply for Llanasa the Local Government Board have written requiring the substitution of larger pipes, the provision of certain standpipes, and a supply by gravitation for Ffynnongroew.

King's Lynn T.C.—A Weir pump is to be obtained for boiler-feed purposes at the pumping station, and the provision of superheaters in connection with the boilers at the electricity works is under consideration.

Poole T.C.—A committee has been appointed to inspect typical installations of water-softening systems with a view to the adoption of a scheme by the council.

Portrush U.D.C.—The council have adopted the plans of the surveyor, Mr. Albert J. Clarke, for the provision of water mains in the extended urban area, at an estimated cost of £496.

Windsor T.C.—Tenders are invited for a scheme for [illegible] filters.

MISCELLANEOUS.

Bolsover U.D.C. It has been decided to purchase new appliances and equipment for the fire brigade, and to erect a building in which to store them.

Cockermouth U.D.C.—A burial ground is to be laid out at an estimated cost of £1,000.

Swansea T.C.—With regard to the question of the reorganisation of his staff, in view of the extension of the borough, the borough surveyor, Mr. J. R. Heath, recently submitted to the Highways Committee a report in which he paid a warm tribute to the seniors and juniors for the way they had worked in the preparatory work for the extension inquiry. They worked every day, Saturdays and Sundays included, and very often till 11 p.m., and sometimes later. The typists particularly worked, very frequently, from 9.30 till after midnight. On the chairman's suggestion, applications for increases of salary were referred to the surveyor for report.

FOR OTHER ADVERTISEMENTS
See End of Paper.

CHERTSEY RURAL DISTRICT COUNCIL.

BYFLEET AND PYRFORD SEWERAGE.

ADDITIONAL PUMPING MACHINERY AND ENGINE-HOUSE.

The above Council invite Tenders for the Erection of an additional Engine-house, Gas Generating-house, new Workshop and Coal Store adjoining the present pumping station, Byfleet Village, together with Engine Beds, and other building works in connection with the above.

Plans, specifications, and full particulars may be seen by appointment at the office of Mr. Charles Muggleton, Byfleet Corner, West Byfleet, on or after the 29th inst. Sealed Tenders, endorsed "Additional Engine-house, &c., Byfleet Tender," to be delivered to H. E. Paine, Esq., clerk to the Council, 80 Guildford-street, Chertsey, before 6 p.m. on Monday, April 22nd.

The Council do not bind themselves to accept the lowest or any Tender.

HERBERT BEENEY,
Engineer and Surveyor to the Council.

West Byfleet,
March 16, 1915. (2,493)

COUNTY BOROUGH OF HUDDERSFIELD
TO TIMBER MERCHANTS AND OTHERS.

The Corporation of Huddersfield invite Tenders for the Supply and Delivery of (approximately) 490,000 Creosoted Baltic Redwood Blocks, size 9 in. by 3 in. by 5 in. deep.

The successful tenderer will be required to execute a Contract, the draft of which may be inspected at the Town Clerk's Office, Town Hall, between 10 and 4 o'clock.

Specifications and Forms of Tender may be obtained on application at the Offices of Mr. K. F. Campbell, M.INST.C.E., Borough Engineer and Surveyor, 1 Peel-street.

Sealed Tenders, endorsed "Tender for Redwood Blocks," signed in the handwriting of the Tenderer, or his Agent, and addressed "Town Clerk, Town Hall, Huddersfield," must reach him not later than 10 a.m. on Wednesday, the 7th day of April, 1915.

The Corporation do not bind themselves to accept the lowest or any Tender.

J. HENRY FIELD,
Town Clerk.

Town Hall, Huddersfield.
March 18, 1915. (2,490)

THAME URBAN DISTRICT COUNCIL.
TENDERS FOR MATERIALS.

The Council of the above District invite Tenders for the Supply of Broken Granite and Iron Slag for the year ending March, 1916.

Particulars and Forms of Tender may be obtained on application to Mr. James T. Robinson, Surveyor, at his Office, Town Hall, Thame, to whom Samples of the Materials tendered for must be sent not later than Monday, March 29th, 1915.

Sealed Tenders must be sent to me not later than Monday, March 29th, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

CHARLES SIMMONS,
Clerk to the Council.

2 High-street,
Thame.
March 15, 1915. (2,491)

CHERTSEY RURAL DISTRICT COUNCIL, SURREY.
APPOINTMENT OF TEMPORARY SURVEYOR.

The above-named Council invite applications for the post of Temporary Surveyor, their permanent Surveyor having joined H.M. Forces for the period of the War.

Candidates must have a good practical knowledge of road making, and be competent to keep the necessary wages books and accounts, and prepare plans and estimates; must be efficient in duties appertaining to the carrying into effect of Building By-laws in reference to buildings in the District; must understand making up of Streets under the Private Street Works Act, and the making of apportionments thereunder; must understand the laying of Sewers and connections therewith; must undertake such other work or other employment as may be given at the Council. Preference will be given to candidates able to take up duties at an early date.

An Office will be provided at Byfleet, and candidates must be prepared to reside in that parish. The candidate appointed must have a cycle and must provide and maintain his own cycle.

Salary £2 per week. Engagement subject to one month's notice to determine on either side.

Area of District (including large area of Common), 16,020 acres; population 1911, 9,383.

Applications, in candidate's own handwriting, stating when the applicant will be at liberty, and giving [illegible] must be accompanied by two recent testimonials, and must reach me not later than [illegible] the 24th day of March, 1915.

Canvassing, either directly or indirectly, will disqualify.

Selected candidates will be notified when and where to attend.

L. PORTER,
Assistant Clerk to the Council.

80 Guildford-road,
Chertsey.
March 17, 1915. (2,492)

PERSONAL.

Mr. F. R. Phipps, borough surveyor of Basingstoke, has received an increase of salary.

Mr. R. Cluer, surveyor to the Launceston Rural District council, died recently, we regret to state, aged sixty-eight.

Mr. A. P. Piggott, of the Stoke Newington surveyor's department, has been raised to the rank of staff sergeant.

Mr. Arnold Rudd, of the engineer and surveyor's department, Sunderland Corporation, has joined the Royal Engineers.

Mr. Robert Walton, of the engineer and surveyor's department, Sunderland Corporation, has joined the Royal Engineers.

Mr. J. H. Chubb, surveyor to the East Kerrier Urban District Council, has resigned owing to continued ill-health.

Mr. George S. Barry, a member of the Dundee city surveyor's staff, has been appointed road surveyor to the Deer District Committee, Aberdeenshire.

Mr. A. K. Hawkins, of the Stoke Newington surveyor's department, who has joined the Army, has been promoted to the rank of company sergeant-major.

Mr. Alfred J. Westaway, of the borough surveyor's department, Totnes, has been appointed assistant engineer and surveyor to the Bridgwater Rural District Council.

Mr. A. J. Marshall, borough engineer of Merthyr, has been presented with a clock and vases by the members of the corporation staff on the occasion of his marriage.

Mr. Osborn C. Hills, F.R.I.B.A., district surveyor for the Strand, read a paper, entitled "The London Building Acts, with some Suggested Amendments," at a meeting of the Concrete Institute last night.

Mr. J. L. Peacock, engineer and surveyor of Newtownards, Ireland, has received a Lieutenancy in the Royal Engineers, and has been posted to the 150th Field Company, stationed at Antrim (Ulster Division).

Mr. Thomas Small, burgh surveyor of Cumnock, has been presented by the members of the town council with a barometer and a purse of sovereigns on leaving to take up his duties as burgh surveyor of Dunbar.

Mr. William Dyack, burgh surveyor of Aberdeen, died last week, we deeply regret to state, after a prolonged illness, in the 68th year of his age. Mr. Dyack was born in Ireland and educated partly there and partly in Aberdeen. He entered the office of the late Mr. John Willet, M.INST.C.E., Aberdeen, as an articled pupil in 1873. He served his pupilage there, and afterwards acted as resident engineer for Mr. Willet on the Cruden Bay, Rosehearty, Gardenstown, and Portsoy Harbour works, and on the Nairn and Banff drainage works. He was for two years on the staff of the contractors for the Tay Bridge railway works, and was also for two years on the staff of the engineer-in-chief of the Great North of Scotland Railway, and acted as resident engineer in their Buckie extension railway. Going to Aberdeen in 1884 as assistant burgh surveyor under the late Mr. William Bolton, he was appointed burgh surveyor in 1892. He was a past-president of the Aberdeen Association of Civil Engineers, and a member of the Institution of Civil Engineers and the Institution of Municipal and County Engineers.

In the list of successful candidates at the recent examinations of the Institution of Civil Engineers, out of forty-eight candidates the names are understood the name of only one Indian appears, that of Sayed Ghulam Mustafa, who is an articled pupil with Messrs. Henry Adams & Son, the well-known civil engineers of Queen Victoria-street, London.

Incorporated Sanitary Association of Scotland.—This body will hold its forty-first annual congress at Glasgow from September 1st to 3rd.

Porthcawl Gasworks Purchase.—It was announced at a meeting of the Porthcawl Urban District Council on Tuesday that the award of the engineer, the Hon. John Donaghmore Fitzgerald, K.C., in the matter of the proposed purchase by the council of the Porthcawl Gas Company's undertaking was £30,850. It was stated that this was practically the figure contemplated by the council at the outset of the negotiations.

Some of the Larger Problems of Town Planning.*

By THOMAS H. MAWSON, M.S.A., F.L.I.A.

In undertaking the remodelling or improvement of an existing city, and especially an ancient city, or in the creation of a new one, we have two problems which, in one way at least, are fundamentally different. In the first case we have before us not only so many streets, so many buildings, and so much space with which to deal, but, what is far more important, the individual communal and civic spirit which has, perhaps, been creating and adapting for centuries, and which has made the city what it is socially, politically, morally, educationally and commercially.

In the new city, on the other hand, we are faced with the task of estimating, so far as we can, what form the city's individuality will take, and how far its course of development may be influenced for good, and to what extent the development is beyond our control, and must be met and allowed for in all our operations.

It will thus be seen that, whether the sphere of operations be an old city or a new one, the first essential of the city planner is a thorough study of the origin and growth of cities coupled with that knowledge of men and things and that reverence for the antique which always accompanies it, so that he may be able to read on the face of things as they exist not only the city's history, but the inspiration of the civic spirit and the individuality resulting therefrom.

From the very earliest days—from the days, in fact, in which men first joined forces for defence against mutual foes, whether they be rival tribesmen or the elemental forces—the paramount motive in city building has been strategic, and nothing is written so largely and so plain to see on the fabric of present this strategic element. At every point in their history it has had its influence, and nothing could be more mistaken than to suppose that it is not visible in the new towns which are growing at the present time in our own country, but more particularly in our colonies. The strategic factor is present to-day, for each city seeks a site which will give it strategic advantages in the field of commerce, just as the old city did for the field of battle. The scene has shifted, but it is the same stage and the same drama, shall we say, "localised."

The reason for the earlier inquiry into the origin of the city we are to plan in particular, and of that of all cities in general, hardly needs elaboration or even explanation, for this is obviously the first step in the study in the growth of cities, and, unless our training in this subject is deep and thorough we cannot rightly estimate the lines on which the city we are planning will develop in the future.

Having thus solved the first point in our study through the city's past, and having determined what factors contributed to its planning, we now have to determine how far those conditions still operate and to what extent, and also what other factors have grown up in the city's life, and are likely to grow up in the future, which will modify or change the direction of these influences.

First of all, throughout our investigations we shall find the evolutionary principle at work, and the more we look into the matter the more we shall become convinced that nothing happens in the whole history of a city which has its influence on its growth or decay, which does not partake of the nature of an influence working through evolutionary processes.

If the town planner is to realise the highest and the best that each opportunity affords he must cultivate the broad outlook, and must carry his survey in beyond the confines of the place itself. Wherever the town is placed the designer will always find it necessary to take into consideration many factors which take him far afield beyond the actual scope of his operations.

I think in the few words I have so far said I have clearly indicated the three great rock-bed principles on which all good work by the town planner must rest, and which apply with equal force to every problem he is called upon to solve.

While, however, it would be disastrous for the town planner to approach his task with preconceived ideas as to the direction his improvements should [illegible] preliminary work in first viewing the sphere of his labours and making an itinerary to get the geographical factors fixed in his mind will revolve round these first principles.

I do not mean that the [illegible] planning of a town should fall upon the shoulders of one man. That is [illegible] individual, and no man could possibly be omniscient enough to [illegible] While admitting many notable exceptions, I would [illegible] and as to the cause of the [illegible] villages and [illegible] far has been that it has been placed in the hands of men who have usually been chosen for the task because they have shown considerable ability in one side of the work—such as architecture or administration—and who have been expected to evolve out of their inner consciousness a scheme which shall fulfil the social, practical, or artistic requirements of which his special training has given him no expert knowledge.

How suicidal such a policy is! You will hardly [illegible] I hope that a town plan ought to be the result of the joint efforts of the surveyor, the architect, the sanitary engineer, and the landscape architect, the sociologist, and, in the case of an old town, the antiquarian, never forgetting, of course, the necessity for legal guidance at every stage of progress.

First will come the antiquarian, who will schedule all that through its connection with the history of the town or its intrinsic beauty must be preserved, and who will prepare archæological records, aided by photographs and plans, of all that is old, but which is not important enough to be allowed to stand in the way of that which is modern and hygienic; then will come the surveyor, who will prepare those contour plans on which all subsequent operations will be based; and after him the sanitary and hygienic engineer, who will determine on the source of the water supply, the pressure at which it can be delivered, and consequently the maximum height up the hillsides to which we may build, the position of his sewerage disposal scheme, and consequently the lowest points at which sewers can be connected to it by gravitation, and will also suggest to the sociologist sites which [illegible] public services, such as power stations, gasworks, and the like. With these materials before him, the sociologist will decide the density of the population and the number of houses to the acre which can be allowed over different parts of the site, the educational and recreative facilities to be provided, the location of varying classes of property with a view to [illegible] between the artisan and his work, and, within the limits specified by the engineer, the location of the factory area. Thus is the material produced for the work of the town planner, and it is his province to take all these results of the labours of his confrères in city building and weld them into one co-ordinate and self-contained whole, a whole which shall express efficiency and beauty from every point of view and from every standpoint, whether that of the architect, garden lover, or sociologist, without sacrificing for one moment any of the solid qualities demanded by the practical citizen. This he will do not by the superposition of merely [illegible] but by balancing mass against open space, height against breadth, the open vista against the enclosed colonnade, level masses of subdued and restrained architectural façades against the telling note of the tower with its strongly marked vertical lines, nobly spreading trees against the open glade, bright colours reflected in still water, and so on, all in mass, and with the broad outlook, leaving to the architect and the horticulturist the filling in of details in a manner consonant with his vision of the city to be.

I do not mean you to infer that each of these specialists will take up the work in turn and do his own special task independently of the others. Their spheres will interlock at every point, and if the city planner adequately fills his office he will be in direct communication with them all during the whole pe-

* From a paper read at the last meeting of the Town Planning Institute

cess. He [illegible] calling for infinite patience and unlimited tact, but above and beyond this his training must fit him to be sympathetic with the aim and the point of view of all the others. He must have a knowledge of, or be found in each and will be necessary to him to work, not only that he may the better understand and appreciate the point of view of each specialist, and so by an diligent sympathetic encouragement, but also that he may adequately estimate the [illegible] which each in turn is the contribute which each specialist will make to the whole and practical outcome, the material of attendance, collective material which the various workers will place in his hand. Nor would the group of specialists [illegible] the same for each fresh feature which would call for fresh expert advice.

Thus we have a brief sketch of our task which though necessarily sketchy and imperfect, cannot fail to raise in the mind of any man who is possessed of sufficient practical imagination to put himself in place in the profession, a great and lasting enthusiasm for the practice of city planning.

Let us take the main principles which stand out as what are a few of the most obvious lessons to be drawn from them. The principles are as follows:

That each part of the city plan and each separate feature should be designed with direct regard to its connection with every other part.

That all efforts of town improvement demand that broad outlook which, by co-operation with other arts and sciences, will embrace and correlate factors concerning to all sides of the problem — aesthetic, ethical, economical, commercial, and recreational.

That the principle of the [illegible], with the several concentrated and the [illegible] should receive due recognition.

That only by the broad outlook which comprehends the past and the present and, as far as is necessary possible, the future, and which will grasp and control all the factors which make for the voluntary advance or decay of cities can success be achieved.

From these ethical principles, which ought to be the dominating influence [illegible] our conception of the art and science of town planning, let us now turn to the economic factors which in this materialistic age are not only to be observed, but which, in the vast majority of cases, are primarily operative to the exclusion of all other factors. Our schemes today have to be something more than academic proposals — we have, in short, to prove that what we plan will also pay, either in the shape of interest (in terms of money) on the capital expenditure, as in waterworks, gas and electric and tram undertakings, or in terms of increased mental power, [illegible] adequate educational facilities, or physical efficiency such as we expect to reap from better housing and the provision of park and playground for the community directly affected.

We must never forget, therefore, that the practical man has always at the back of his mind an adequate return on the expenditure and [illegible] right to expect it. I would urge upon every town planner that the only reasonable position we can assume is that an adequate return on municipal expenditure can only be attained by the adoption of town planning methods, and this further fact that, when we have attained perfect efficiency, which is always economic, in any department of our enterprise, we have at least laid the foundation of true beauty, for utility itself is potentially beautiful. On [illegible] park, is only economic in proportion to the number [illegible]

[illegible] compact with its many activities, commercial and [illegible] ducing the wear and tear over main arteries by the reduction of heavy traffic by placing factories and power stations and warehouses in direct connection with railway system, river and sea ports.

[illegible] workpeople in the most perfect manner, and from this a reflex action is now taking place, and the additional profits derived from an economic position, [illegible] model town, [illegible] on its part [illegible] dends under [illegible] to be disposed of [illegible] and [illegible] efficiency.

The circulatory system of arteries and main roads should form the first [illegible] plan and [illegible], to my mind, be first solved diagrammatically, our first care being to secure a scientific and economic [illegible] with [illegible] and avoid [illegible] on [illegible] for every [illegible] in the [illegible] community.

ARTERIAL ROADS IN MIDDLESEX.

PROPOSALS FOR NEW HIGHWAYS.

At the [illegible] meeting of the County Council of Middlesex the principle of the construction of new arterial roads in the county, in accordance with suggestions [illegible] on the map prepared by the county engineer, Mr. H. T. Wakelam, was approved.

Route No. 1 was shown to commence at Hampton Road, at a point on with the main St. Albans road, and the main Great North Road; thence following a route through the northern part of the county, crossing the main Edgware road, and passing between Wembley and Harrow, and on through Perivale, Ealing, Hounslow, Hanworth, and Sunbury to Chertsey Bridge. At the last-mentioned point the road would link up with the proposal of the Traffic Branch of the Board of Trade.

Route No. 2 was shown on the map to cross the county near east to west from a junction with the main Oxford road at a point near Denham, proceeding thence past Harefield-place, Ruislip, Pinner Wood, the Red Hill, Mill Hill, Finchley, Friern Barnet, Southgate, and Edmonton, to link up with the main Colchester road.

Route No. 3 was shown to link up with Route No. 1 at a point near Ruislip, passing thence by way of Ickenham, Greenford, Ealing, and Acton to North Kensington.

The whole scheme [illegible] of a comprehensive character, the length of the three routes being about 55 miles. It was estimated that the total cost of the scheme, so far as Middlesex was affected, would be about £5,000,000 sterling.

The value of the scheme, both from a traffic and [illegible] point of view, would be considerable.

QUERIES AND REPLIES.

[illegible] undertake to reply to any [illegible] communicated by the readers, and address [illegible] required [illegible] [illegible] [illegible]

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

SOUTH-WESTERN DISTRICT.

A South-Western District meeting will be held at the Municipal Buildings, Taunton, on Thursday, March 25th, at 3 p.m.

PROGRAMME.

To read the minutes.

To receive the report of the Committee.

To receive communications from the Council.

To elect officers.

To elect members of Council.

To appoint Local Secretaries.

To appoint Auditors.

To appoint the next meeting place.

To read a paper by Mr. D. M. Lloyd, borough surveyor, Taunton.

To visit the Municipal Buildings on the invitation of Alderman F. W. Penny, J.P., Chairman of the Taunton Town Council.

To discuss the question of the Institution of Municipal Engineers.

To transact any other business that may be brought forward.

Taunton.

SOUTH WALES DISTRICT.

A South Wales District meeting will be held at the City Hall, Cardiff, on Saturday, March 27th, at 3 p.m.

AGENDA.

(1) To read the minutes of the last meeting.

(2) To elect a district secretary.

(3) To receive nominations for district representative.

To read a paper by Mr. D. M. Lloyd (Taunton), entitled "The Sanitary Inspector: His Duties, and How to Perform Them."

To visit the Docks, and other places of interest in connection with the Port of Cardiff.

To transact any other business that may be brought forward.

Briton Ferry.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 3.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

CLERK OF WORKS.—March 20th.—Rural District Council. £1 1s. per week. Clerk of Works, Council Offices, Lutterworth.

COUNTY SURVEYOR.—March 20th.—Notts County Council. £500 per annum.—Mr. H. Hampton Copnall, clerk, Shire Hall, Nottingham.

CLERK OF WORKS.—March 20th.—Rothwell Urban District Council. £130 per annum. Mr. I. G. G. Thomas, clerk.

CLERK OF WORKS.—March 20th.—Rothwell Urban District Council. £130 per annum. Mr. W. Thomas, clerk, Rothwell, Leeds.

ASSISTANTS.—March 22nd.—Darlington Town Council. £90 and £80 per annum. Mr. G. Watson, borough surveyor.

JUNIOR ASSISTANT.—March 22nd.—Corporation of Dewsbury. 25s. per week. Mr. Geo. Wilson, borough engineer, Town Hall.

CLERK OF WORKS.—March 22nd.—Monmouthshire County Council. £2 10s. per week.—Mr. H. Stafford Gustard, clerk, Monmouthshire County Council, Newport, Mon.

TEMPORARY ARCHITECTURAL ASSISTANT.—March 22nd.—Darlington Town Council. £2 10s. per week.—Mr. G. Winter, borough surveyor.

BOROUGH ENGINEER AND SURVEYOR.—March 22nd.—Corporation of Mansfield. £400–£600 per annum.—Mr. J. Harrop White, town clerk.

SURVEYOR.—March 23rd.—Kintyre District Argyllshire County Council. £250 per annum.—The Clerk, Kintyre District, Campbeltown.

TEMPORARY ENGINEERING ASSISTANT.—March 23rd.—Corporation of Dewsbury.—Mr. Henry [illegible] Engineer, Town Hall, Dewsbury.

CLERK (DRAUGHTSMAN).—March 23rd.—[illegible] £120–£130 per annum.—Mr. W. Jervis, county road surveyor, County Hall, [illegible].

BOROUGH SURVEYOR AND ENGINEER.—March 24th.—Corporation of Stockton-on-Tees. £500–£700.—Mr. Arthur B. Crosby, town clerk, Borough Hall, Stockton-on-Tees.

HIGHWAY SUPERINTENDENT.—March 24th.—Watford Urban District Council. £180–£200 per annum.—Mr. W. [illegible], Surveyor, Office, 14 High-street, Watford.

SURVEYOR.—March 24th.—[illegible] District Council. £3 3s. per week. Chairman, Royal White Hart Hotel, Beaconsfield.

SANITARY INSPECTOR.—March 25th.—Sutherland County Council. £120 per annum.—Mr. A. Argo, county clerk, Golspie, Sutherlandshire.

SURVEYOR OF HIGHWAYS.—March 25th.—Abingdon Rural District Council. £2 10s., to a maximum of £150. Messrs. B. & E. M. Challoner, clerk, 6, Stert-street, Abingdon.

SURVEYOR OF HIGHWAYS.—March 26th.—[illegible] Rural District Council. £100 a year.—Mr. T. J. Llewellin, clerk, Westgate-street, Launceston.

WATER FITTER AND TURNCOCK.—March 27th.—Corporation of Tiverton. 30s. per week.—Mr. J. Siddalls, borough surveyor, Town Hall.

BOOK-KEEPER AND STORES CLERK.—March [illegible] Corporation Electric [illegible] Mr. C. E. Rivers, borough engineer, Municipal Offices.

SURVEYOR'S JUNIOR ASSISTANT.—March 29th.—Corporation of Congleton.—Mr. J. H. Walters, borough surveyor, Town Hall, Congleton.

SURVEYOR AND INSPECTOR.—March 29th.—Bolsover Urban District Council. £160 per annum.—Mr. H. J. Watson, clerk, 32 Glumman-gate, Chesterfield.

BUILDING INSPECTOR AND CLERK OF WORKS.—March 30th.—Corporation of Torquay. £130 per annum.—Mr. Henry A. Garrett, borough engineer and surveyor, Town Hall.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

COST CLERK.—Sheffield Corporation.—General Manager, Water Department, Town Hall.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 3.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

WHITEHAVEN.—April 21st.—Competitive designs [illegible] 25 poles) and the erection of houses, for the town council. Premiums, 30, 20 and 10 guineas.—Mr. T. [illegible].

GALEMIRE.—Designs for a small hospital, for the Galemire (Whitehaven) Joint Hospital Committee.—Mr. E. B. Croasdell, clerk, Union Hall, Whitehaven.

STEPNEY.—Designs for municipal buildings, for the borough council. Mr. H. T. Hare, F.R.I.B.A., has been appointed assessor.—Mr. G. W. Clarke, town clerk, 15 Great Alie-street, Whitechapel.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 3.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

STEVENAGE.—March 22nd.—For the erection of eight cottages, for the urban district council.—The Surveyor.

TUNBRIDGE WELLS.—March 22nd.—For the [illegible] tion of a [illegible] mortuary and engine [illegible] for the corporation.—Mr. W. H. Maxwell, borough waterworks engineer.

MONMOUTH.—March 22nd.—For the erection of a domestic arts centre, for the Education Committee.—Mr. J. Bain, County Council Offices, Newport, Mon.

CHELMSFORD.—March 22nd.—For the erection of an engine-house and incidental works, for the corporation.—Mr. P. T. Harrison, borough engineer.

DROMORE.—March 23rd.—For the erection of twenty-one cottages, for the rural district council.—Mr. N. Naughton, clerk.

EPSOM.—March 23rd.—For the erection of ten cottages, for the rural district council.—Mr. A. C. Williams, architect and surveyor, Council Offices.

SOUTHALL-NORWOOD.—March 23rd.—For the erection of fifty-four houses, for the urban district council.—Mr. R. Brown, engineer and surveyor, Southall.

SHEFFIELD.—March 24th.—For the erection of public conveniences in various parts of the city, for the Health Committee of the Sheffield City Council.—Mr. Charles F. Wike, city engineer, Town Hall.

MANCHESTER.—March 24th.—For the erection of baths, for the Baths Committee.—City Architect, Town Hall.

HOVE.—March 24th.—For the construction of a public library, for the corporation.—Borough Surveyor.

SOMERSET.—March 24th.—For the erection of a sanatorium, for the county council.—Mr. A. J. Pictor, architect, Bruton, Somerset.

NORTHAMPTON.—March 25th.—For the erection of twenty cottages, for the corporation.—Waterworks Office, Fish-street, Northampton.

GLAMORGAN.—March 27th.—For the erection of a new school and alterations and extensions to existing school, for the county council.—County Hall, Cardiff.

SPALDING.—March 27th.—For the erection of three cottages and outbuildings, for the rural district council.—Messrs. Davis & O'Crowley, architects, 6 Double-street, Spalding.

DUNDEE.—March 29th.—For the erection of an electricity sub-station, for the corporation.—Mr. H. Richardson, general manager and engineer, Electricity Department, Dundee.

KENDAL.—March 29th.—For the construction of walls in blue brick at the sewage disposal works, for the corporation.—Mr. F. W. Oxberry, borough engineer and surveyor.

LLANELLY.—March 29th.—For the erection of sixty-one houses, for the corporation.—Borough Surveyor.

LEYTON.—March 30th.—For the erection of underground conveniences, for the urban district council.—Mr. E. H. Essex, surveyor, Town Hall.

HAMMERSMITH.—March 30th.—For taking down and subsequently re-erecting the temporary floor over a swimming bath, for the borough council.—Mr. H. Mair, borough surveyor.

BRADFORD.—March 30th.—For the erection of a [illegible] for the corporation.—City Architect, Town Hall.

CARMARTHEN.—March 31st.—For the erection of [illegible] for the county council.—Mr. W. V. Morgan, county architect, County Education Offices, Carmarthen.

ANBRIDGE.—April 2nd.—For the [illegible] of waterworks, for the rural district council.—Mr. A. Powell, engineer, 10 Orchard-street, College Green, Bristol.

ERITH.—April 3rd.—For the extension of the sanatorium, for the urban district council.—Mr. H. Hind, surveyor.

ANGLESEY.—April 7th.—For the erection of new schools, for the Education Committee.—Mr. J. Owen, county architect, Menai Bridge.

CORNWALL.—April 10th.—For the erection of a school, for the Education Committee.—Mr. B. C. Andrew, architect, Biddicks-court, St. Austell.

Iron and Steel.

BELPER.—March 25th.—For providing and laying cast-iron pumping main, for the urban district council.—Messrs. G. & F. W. Hodson, Bank Chambers, Loughborough.

NEATH.—March 25th.—For laying a wrought-iron [illegible] for the corporation.—Mr. R. V. Bevington, [illegible].

CARMARTHEN.—March 26th.—For providing and laying water mains, for the rural district council.—Mr. W. E. Jones, surveyor, Rock Hill, Llanarthney.

Roads.

ILFORD.—March 22nd.—For making up certain roads, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

MELTON MOWBRAY.—March 22nd.—For asphalting and repairing footpaths, for the rural district council.—Mr. E. C. Morrison, surveyor.

ILKESTON.—March 22nd.—For the supply of 2,000 tons of tar-macadam, 500 tons of broken granite, 1,500 tons of furnace slag, 100 tons of granite setts, and 500 yds. of kerbs, for the corporation.—Mr. Henry Jas. Kilford, borough surveyor.

CASTLEFORD.—March 22nd.—For works of street improvement, for the urban district council.—Mr. W. Green, surveyor.

COVENTRY.—March 22nd.—For the supply of broken road stone, granite kerbs, granite setts, stoneware pipes, castings, and workmen's tools, for the corporation.—City Engineer.

EAST PRESTON.—March 22nd.—For the supply of flints, pea beach or grit, and refined tar, for the rural district council.—Mr. A. Shelley, clerk, Littlehampton.

SUTTON BRIDGE.—March 22nd.—For the supply of road materials, for the urban district council.—Mr. T. J. Whitehead, surveyor.

HUNTS.—March 22nd.—For the supply of road materials, for the county council.—Mr. Herbert Leete, county surveyor, High-street, Huntingdon.

EARSDON.—March 22nd.—For the supply of hand-broken whinstone slag, whinstone kerb, and cartage, for the urban district council.—Mr. J. R. McMillen, surveyor, Council Offices, Shiremoor, Northumberland.

WEMBLEY.—March 23rd.—For making up two roads, for the urban district council.—Mr. C. R. W. Chapman, surveyor.

POOLE.—March 23rd.—For the supply of granite and basalt, for the corporation.—Mr. S. J. Newman, borough surveyor.

MOUNTAIN ASH.—March 23rd.—For the execution of street works, for the urban district council.—Mr. W. G. Thomas, surveyor.

FARNHAM.—March 23rd.—For cleansing and tar-painting road surfaces, for the urban district council.—The Surveyor.

PERSHORE.—March 23rd.—For the supply of stone and stone hauling in the district, for the rural district council.—Mr. A. E. Baker, clerk.

DOCKING.—March 23rd.—For the supply of materials and team labour, for the rural district council.—Mr. W. W. Hopking, surveyor, Great Bircham, Norfolk.

SHOEBURYNESS.—March 23rd.—For the supply of carts and men for street-watering and general purposes, for the urban district council.—Mr. W. Stafford, surveyor.

SALFORD.—March 23rd.—For sewering, paving and flagging, for the corporation.—Borough Engineer.

DUNDEE.—March 23rd.—For the supply of [illegible] broken and machine-broken whinstone setts and kerb, for the Harbour Trustees.—Mr. J. H. Thorburn, general manager and engineer.

CLAYTON-LE-MOORS.—March 23rd.—For the supply of road materials, for the urban district council.—Mr. W. Dodgson, surveyor.

WANSTEAD.—March 24th.—For [illegible] district roads, for the urban district council.—The Surveyor.

BREDBURY AND ROMILEY.—March 24th.—For the supply of road materials, for the urban district council.—The Surveyor, School Brow, Romiley.

LONGBENTON.—March 24th.—For the supply of hand-broken whinstone, for the urban district council.—Mr. W. Bean, highway surveyor, Council Offices, Forest Hall.

NEWPORT (Mon.).—March 24th.—For the execution of private street works, for the corporation.—Borough Engineer.

ORMSKIRK.—March 24th.—For the supply of road materials, for the urban district council.—Mr. H. W. Chadwick, surveyor.

OXFORD.—March 24th.—For the supply of road materials, for the corporation.—Mr. W. H. White, city engineer.

WESTHOUGHTON.—March 24th.—For a steam road roller and scarifier, nominal weight of roller

supply to be 10 tons for the urban district council. Mr. Thos. Partington, clerk.

EAST STOW.—March 24th. For making up Victoria-road, Stowupland, for the rural district council. Mr. H. E. Wilkes, clerk, Market-place, Stowmarket.

STROOD.—March 24th.—For the supply of road materials, for the rural district council.—Mr. L. Randerson, surveyor, Meopham, near Gravesend.

STALYBRIDGE.—March 24th.—For the supply of flags, kerbs, tarred macadam, artificial limestone, asphalt, and other materials, for the [illegible]. Mr. J. N. White, borough surveyor.

SUDBURY.—March 24th.—For the supply of crushed granite, for the corporation.—Borough Surveyor.

CARSHALTON.—March 24th.—For treating about 90,000 sqs. super of road with bituminous dust preventing material, for the urban district council.—Mr. E. W. Morley, acting clerk, District Council Offices, Carshalton.

SOUTH SHIELDS.—March 24th.—For private street works, for the corporation.—Mr. Leslie Rosevcare, borough engineer.

WINDLESHAM.—March 24th.—For the supply of road materials, for the urban district council.—Mr. W. Dickenson Bell, surveyor, Council Offices, Bagshot.

BIGGLESWADE.—March 24th. For making up street, for the urban district council.—Mr. T. Cockrill, surveyor, Market-place.

HEMSWORTH.—March 24th. For the supply of broken and unbroken whinstone, limestone, granite and dross, for the rural district council.—Mr. T. H. Richardson, surveyor, Hemsworth, near Wakefield.

WOODBRIDGE.—March 25th.—For the supply of 240 tons of broken granite, [illegible] for the rural district council.—Mr. W. Grout Whisstock, surveyor.

CHATHAM.—March 25th.—For the supply of broken flints, Kentish ragstone, and artificial stone paving, for the corporation.—Borough Surveyor.

CROYDON.—March 25th. For [illegible] square yards of road, for the rural district council.—Mr. R. Chart, junr., highway surveyor.

PETERBOROUGH.—March 25th. For the supply of broken granite, granite kerb, and granite channelling, for the corporation.—Mr. J. W. Walshaw, city surveyor.

ALTRINCHAM.—March 26th.—For the supply of tarred macadam, [illegible] granite setts, Kentish ragstone setts, and limestone chippings, for the urban district council.—Mr. H. E. Brown, surveyor, Town Hall.

WILMSLOW.—March 27th. For paving [illegible] with granite setts, for the urban district council.—Mr. A. S. Cartwright, surveyor.

EAST GRINSTEAD.—March 27th.—For the supply of tarred slag macadam, [illegible] granite chippings, Kentish ragstone, hand-picked surface flints (broken), clean brick rubble and steam rolling, for the urban district council.—Mr. W. E. Woollam, engineer and surveyor.

ISLIP NORTHWOOD.—March 27th. For the supply of broken granite, gravel, hedging, [illegible] steam roller, and team labour.—Mr. W. L. Carr, surveyor.

LEPTON.—March 27th. For the supply of [illegible] granite, limestone, slag, broken boulders, and local gravel, for the rural district council.—Mr. T. R. Sidgwick, surveyor of highways, Willington, Derby.

ROTHERHAM.—March 27th.—For the supply of road materials, for the corporation.—Borough Engineer.

RICCALL.—March 27th. For the supply of road materials, for the rural district council.—Mr. J. Townend, clerk.

STAFFORD.—March 27th. For the supply of granite and slag, for the rural district council.—Mr. F. Idiens, surveyor, 3 Crabbery-street, Stafford.

GATESHEAD.—March 27th.—For the supply of road materials, for the corporation.—Mr. N. P. Pattinson, borough engineer.

WATH-UPON-DEARNE.—March 29th.—For the supply of macadam, [illegible]-macadam, kerbs, flags, and setts, for the urban district council.—Mr. J. H. Drew, engineer and surveyor.

DROXFORD.—March 29th.—For the supply of 1,250 tons of granite or hard stone, for the rural district council.—Mr. J. King, surveyor, Droxford, Hants.

BRIDGE.—March 29th.—For the supply of surface-picked and other hard flints and gravel, for the rural district council.—Mr. S. Sladden, highway surveyor, Littlebourne, Canterbury.

SKIPTON.—March 29th. For the supply of [illegible] stone, granite, York setts, kerb and team labour, for the urban district council.—Mr. A. E. W. Aldridge, surveyor.

CARDIGANSHIRE.—March 30th.—For strengthening and surfacing the Cardigan to Cenarth main road with Welsh granite and tar-spraying, for the county council.—Mr. D. Davies, county surveyor, County Surveyor's Office, Brynhyfryd, Felinfach S.O.

GATESHEAD.—March 30th.—For cement path work in position, for the corporation.—Mr. N. P. Pattinson, borough engineer.

HADLEIGH.—March 30th.—For the supply of granite, for the urban district council.—Mr. H. W. F. Grimwade, clerk.

MID-LOTHIAN.—March 30th.—For conveying road materials, for the county council.—Road Offices, County Buildings, Edinburgh.

RICHMOND.—March 31st.—For repaving with granite the roadway of Richmond Bridge and approaches, for the Richmond Bridge Commissioners.—Mr. E. Cruttwell, engineer, 2 Queen Anne's-gate, Westminster.

MALDON.—March 31st.—For the supply of broken granite, granite chippings and flints, also for steam rolling, for the corporation.—Mr. Thos. R. Swales, borough engineer and surveyor, Municipal Offices.

WITHNELL.—March 31st. For the supply of broken granite, chippings and limestone, for the urban district council.—Mr. J. Taylor, clerk.

LEPTON.—April 1st.—For the supply of granite and dross, for the urban district council.—Mr. G. W. Smith, clerk, 23 John William-street, Huddersfield.

LEPTON.—April 2nd. For steam rolling and scarifying, for the urban district council.—Mr. G. W. Smith, clerk, 23 John William-street, Huddersfield.

KIRKBURTON.—April 2nd.—For steam rolling and scarifying, for the urban district council.—Mr. G. W. Smith, clerk.

RAMSEY.—April 3rd.—For the supply of tarred slag, broken granite, and granite chips, for the urban district council. Mr. R. F. Serjeant, clerk.

GLASGOW.—April 6th.—For paving several streets with compressed rock asphalt, for the corporation.—[illegible]

HOUGHTON-LE-SPRING.—April 8th.—For the supply of machine-broken blast-furnace slag, hand-broken whinstone, slag, and blue limestone riddlings, [illegible]

BULKINGTON.—April 10th. For the supply of broken granite and haulage, for the urban district council. Mr. C. Blakeway, clerk, 2 Church-street, Nuneaton.

CAVAN.—For breaking and rolling the county roads, [illegible]

Sanitary.

WAKEFIELD.—March 22nd. For [illegible] for the corporation.—Mr. J. P. Wakeford, city surveyor.

EARSDON.—March 22nd.—For scavenging the district, for the urban district council. Mr. J. R. McMillen, surveyor, Council Offices, Shiremoor, Northumberland.

INCE.—March [illegible]. For the construction of sewage disposal works, for the urban district council.—Mr. A. T. Swain, engineer and surveyor.

SEFTON.—March 23rd.—For emptying ashpits, for the rural district council.—Mr. F. Pool, surveyor, Lydiate-lane, Sefton.

TAMWORTH.—March 24th.—For the conversion of privies into water-closets, for the corporation.—Mr. F. E. G. Bradshaw, borough surveyor.

WANSTEAD.—March 24th.—For collecting household refuse, for the urban district council.—Council Offices.

FINCHLEY.—March 24th.—For the construction of four clinker sewage filters, for the urban district council.—Mr. C. J. Jenkin, engineer, Council Offices.

WEST LANCASHIRE.—March 24th.—For the removal of house refuse, for the rural district council.—Mr. J. Ainsworth, inspector, Banks, near Southport.

PONTYPRIDD.—March 25th.—For laying cast-iron pipe sewer and egg-shaped brick sewer, for the Main Sewerage Board.—Mr. T. Bowen, surveyor, Maesderwen, Graig, Pontypridd.

CRANBROOK.—March 29th.—For the construction of sewage disposal works, for the rural district council.—Mr. J. H. Bailey, sanitary surveyor.

SOUTHGATE.—March 30th.—For the supply of disinfectants, for the ensuing [illegible] council.—Mr. C. G. Lawson, surveyor.

CHURCH.—April 5th.—For work of sewerage, for the urban district council.—Mr. J. B. [illegible], surveyor, Church, Lancs.

PRESTWICH.—April 6th.—For the construction of a storm-water drain, tube sewers, and manholes, for the urban district council.—Mr. S. H. Morgan, engineer, Prestwich, Lancs.

RUISLIP-NORTHWOOD.—April 7th.—For certain supplementary works for sewage disposal at the purification works, consisting of sedimentation tank, bacteria beds, humus tank, pipe connections, sluice gates, valves, and other fitments, for the urban district council.—Mr. H. Howard Humphreys, consulting engineer, 28 Victoria-street, Westminster, S.W.

UXBRIDGE.—April 8th.—For the construction of a sewerage scheme, for the rural district council.—Mr. J. W. Harrison, engineer and surveyor.

THURROCK.—April 19th.—For the construction of about 4 miles of stoneware and iron sewers of 9-in., 12-in. and 15-in. diameter, with manholes and other appurtenances, [illegible] tion tank, and about 1½ miles of 12-in. pumping main, for the Joint Sewerage Board.—Mr. G. M[illegible], engineer, Caxton House, Westminster, S.W.

Stores.

WINDLESHAM.—March 24th.—For the supply of Leicestershire or other granite, granite chippings, quartzite, tar-macadam, tar-paving, Farnham Hungry Hill flints, fine footpath gravel, cartage, hire of 10-ton steam roller, fodder, and horse-shoeing, for the urban district council.—Mr. W. Dickenson Bell, surveyor, Council Offices, Bagshot.

GREAT CROSBY.—March 24th.—For the supply of granite macadam and chippings, limestone chippings, tarred limestone macadam, Portland cement, stoneware pipes, disinfectants, pitch and tar, incandescent mantles and chimneys, glass for street lamps, horse provender, granite setts, and extra horse hire, for the urban district council.—Mr. Joseph A. Wright, surveyor, Council Offices, Coronation-road, Great Crosby.

KENT.—March 27th.—For the supply of shovels, forks, scavenging brooms, scoops, scrapers, cart grease, tallow, oil, tools, and other materials, for the county council.—Mr. W. B. Prosser, clerk, Sessions House, Maidstone.

ROTHERHAM.—March 27th.—For the supply of broken granite, broken [illegible], tarred limestone, concrete flags, Portland cement, timber, pitch and creosote oil, grit-stone setts and kerbs, granite setts, and stoneware pipes, for the [illegible] Borough Engineer.

GUILDFORD.—March 28th.—For the supply of broken granite, broken [illegible], tarred limestone, concrete flags, Portland cement, timber, pitch and creosote oil, grit-stone setts and kerbs, granite setts, and stoneware pipes, disinfectants, horse hire and cartage, [illegible] steam pipes, [illegible] Particulars from [illegible] veyor, Town Gate, Guildford.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted † Recommended for acceptance

ELLOUGHTON.—[illegible] for the construction of [illegible] for the [illegible]
Stockham & Sons, Brentwood [illegible]
S. Palmer, Brentwood [illegible]
C. Bryer [illegible]

BRIERFIELD.—For [illegible] district council.—Mr. E. [illegible], surveyor.
E. Atherton & Son, Brierfield, Burnley [illegible]

CHISLEHURST.—The following tenders were accepted by the urban district council for the [illegible] next:—
Tar-paving.—Bep[illegible] at local railway stations.
Granite Kerb [illegible] per foot, delivered.
Granite 'Setts' [illegible] per ton.
Granite.—Fry Brothers, 16s. 3d., 16s. 9d., 16s., 17s. per ton.
Stoneware Goods.—Knowles & Co., £12 2s. 5½d. total.
Stoneware Interceptors.—Knowles & Co., £7 2s. per dozen.
Cement.—Foots Cray Brick Company, £3 17s. per ton.
Bricks.—Foots Cray Brick Company, £1 18s. per 1,000.
Lime.—South Suburban Gas Company, 3½d. per 20 gallons.
Cleanse.—Hesmondhalgh & Co., per 9s. 6d. [illegible].
Pitch.—Holmes & Co., 29s. 6d. per ton.

CRAVEN[illegible]TON.—For the supply of [illegible] material, cartage, and hire of steam roller and water cart, for the urban district council.—Mr. J. Coulson, surveyor.
Team, Labour for Scavenging House Refuse.—Cramlington Agricultural Co-operative Society, Ltd., Cramlington, per pair of horses and carts and driver.
Team, Labour for Scavenging House Refuse.—Lord Hastings' Trustees, Dudley, per O., £40 per annum.
Team, Labour for Scavenging Purposes.—J. D. Forster, Cramlington, and E. Hall, Cramlington [illegible] per day.
Cartage of Stone to Workers' Road.—J. D. Forster, Cramlington, and G. & J. Ritson, Dudley R.S.O. [illegible], 9d. to 1s. 6d. per ton according to distance.
Broken Wrought Sandstone for [illegible].—Wharncliffe Silkstone Colliery Company, Sheffield, and M. Appleby, Limited, Leeds (divided), 7s. 5d. to 8s. 3d. per ton.
Tarred Slag and Other Slag.—Slag and Tarmacadam Company, Darlington, Limited, South Shields, and Sir B. Samuelson & Co., Limited, Middlesbrough, at prices ranging from 9d. to [illegible] per ton.
Hire of Steam Roller.—W. Bland, Gosforth, 2s. 9d. per hour.

ELLAND.—For [illegible] certain roads, for the urban district council.—Mr. P. H. Whitwam, surveyor.
A. & R. Milner, Elland.†
R. Naylor & Sons, Bradford.
Marshall & Brotherton, [illegible].
S. & S. Sykes, Hudder-field.
[illegible]
[illegible]
H. J. Bayes, Beckett [illegible]
S. Bedford, Halifax.

GUISBOROUGH.—For the supply of crushed whinstone, tarred whinstone, ordinary slag, tarred slag, and concrete flags and kerbs, for the urban district council.—Mr. R. H. Kilburn, surveyor:—

[illegible]	[illegible]	[illegible]	[illegible]
Sir B. Samuelson, Limited, Middlesbrough	[illegible]	[illegible]	[illegible]
Slag and Tar Macadam Company, Darlington	[illegible]	1	1
[illegible]	[illegible]	[illegible]	[illegible]
J. W. Walker & Co., Middlesbrough	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Guisbrough Mining Company, Middlesbrough	[illegible]	[illegible]	[illegible]
Cradock, Allison, Limited, Lackenby	[illegible]	[illegible]	[illegible]
Monkhouse & Peart, Waterhead	[illegible]	[illegible]	[illegible]

PAVING WHINSTONE

Cradock, Allison, Limited, Lackenby	14 0	12 0	10 6

CONCRETE KERBS

Bolckow, Vaughan & Co., Middlesbrough, 2½ in. thick, 2s. per yard.
Bolckow, Vaughan & Co., Middlesbrough, 2½ in. thick, 2s. per yard [illegible] by 6ft., 2s. 2d. per [illegible]

FLAGS

Bolckow, Vaughan & Co., Middlesbrough, 2½ in. thick, 2s. per yard.

HAMMERSMITH.—For [illegible] apparatus at Thornfield-road school, for the London County Council:—
B. Harlow & Son, Maccle-field [illegible] £1,195
[illegible]
[illegible]
Limited, Victoria-street [illegible]
Yetton & Brockett, Limited, Southwark [illegible]
[illegible] [illegible]
[illegible] [illegible]
H. J. Cash & Co., Limited, Westminster [illegible]
R. H. & J. Pearson, Limited, Notting-hill-gate [illegible]
[illegible] [illegible]
[illegible] [illegible]

HOLYWELL.—[illegible] Holywell Urban District Council:—
[illegible] [illegible] [illegible] [

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. MARCH 26, 1915. No. 1,210.

Minutes of Proceedings.

River Pollution by Trade Effluents.

The result of the appeal in *West Riding Rivers Board* v. *Loutheon Urban District Council* is hardly calculated to smooth the path of local authorities who have to deal with manufacturers' effluents. It will be remembered that the decision of the Divisional Court now reversed by the Court of Appeal was that proceedings cannot be taken against a local authority under sec. 4 of the Act for causing or permitting polluting liquid proceeding from a factory or manufacturing process to fall into or be carried into a stream, but that any such proceedings must be against the manufacturers. We commented upon that decision in our issue of May 8th last, when we stated that the conclusion of the Court seemed to us not only to be amply warranted by the language of sec. 6, but also to be in accordance with the equities of the matter, especially bearing in mind the obligation put upon the sanitary authority by sec. 7 to afford facilities for the discharge of trade effluents into their sewers. Our readers are of course familiar with the Act, but we may remind them that it is divided into four "Parts," dealing respectively with "Law as to Solid Matters," "Law as to Sewage Pollutions," "Law as to Manufacturing and Mining Pollutions," and "Administration of Law." The Third of these Parts (with which we are more immediately concerned) consists of sections 4, 5 and 6. Sec. 4 is directed against pollution from manufactories, and sec. 5 against pollution from mines. Sec. 6 (which is the important one in this case) provides that proceedings shall not be taken "under this Part of this Act," except by a sanitary authority, nor without the consent of the Local Government Board. In giving or withholding their consent, the Board are to have regard to the industrial interests involved and the circumstances of the locality, and they are not to consent to proceedings by the authority of any district which is the seat of a manufacturing industry, unless satisfied that means for rendering the effluents harmless are reasonably practicable, and that no material injury will be inflicted on such industry. Moreover, the alleged offender is to have an opportunity of being heard before the authority against proceedings being taken, "so far as the same relate to his works or manufacturing processes."

Now, as pointed out by Mr. Justice Bankes in the Divisional Court, this section deals with two classes of persons—viz., the persons *by* whom proceedings are to be taken, and the persons *against* whom proceedings are to be taken. "Person," it is to be remembered, by the definition clause includes any body of persons, whether corporate or unincorporate. The "person" to take proceedings is the "sanitary authority"—*i.e.* (outside the Metropolis), the urban or rural sanitary authority acting in the execution of the Public Health Act, 1875. Obviously they could not take proceedings against themselves, and hence the section is evidently framed upon the assumption that the persons to be proceeded against are the manufacturers. This appears in the principles laid down for the guidance of the board in giving or withholding their consent, in the restriction placed upon their consent, and still more emphatically in the power given to any person to object to proceedings being taken "so far as the same relate to his works or manufacturing processes." But under sec. 14, subsec. (3) of the Local Government Act, 1888, that board were authorised to constitute bodies representing the counties through which a river flows, and to confer upon [illegible] the powers of a sanitary authority under the Act of 1876. The West Riding Rivers Board is a body so constituted, and that board have power to take proceedings under the Act, thus giving rise to a situation which could not have been contemplated at the time when it was passed, and revealing the difficulties in its interpretation which have appeared in the present case.

The Court of Appeal, in differing from the Divisional Court, and holding that a sanitary authority can be proceeded against under sec. 4, based their decision upon sec. 8, which provides that every sanitary authority shall (subject to the restrictions contained in the Act) have power to take proceedings in respect of the pollution of a stream within their district against any other sanitary authority or person, whether the offence is committed within or without the plaintiff authority's district. The words of this section are no doubt wide enough to include proceedings under sec. 4, and the Court thought that no inference to the contrary could be drawn from sec. 6. This decision, it will be noted, merely disposes of the preliminary objection raised by the council that no proceedings could be taken against them. It still remains to be decided whether the alleged offence was in fact committed by them. Presumably it also leaves open the question whether, when trade effluents flow into a stream after passing through a sewer vested in a sanitary authority, that authority can be deemed to "knowingly permit" the effluents to flow, within the meaning of that section. Prior to the passing of the Rivers Pollution Prevention Act, 1893, it was held that no offence was committed by a sanitary authority under sec. 3 merely because sewage was discharged into a stream through a sewer not constructed by but vested in them. It was in consequence of this decision that the Act of 1893 was passed, providing that in such circumstances the

sanitary authority shall for the purposes of sec. 3 be deemed knowingly to permit the sewage to flow. It is significant that there is no similar provision with respect to offences under sec. 4.

* * *

Proposed Civic Surveys.

In November last we called attention to the then newly constituted Professional Classes War Relief Council, which was created for the purpose of attempting to meet the pressing needs of the large numbers of professional men and women whose means of livelihood had been taken from them owing to the outbreak of the war. The council has since its inception done much practical work, and many deserving cases have received assistance; and now in conjunction with other societies a scheme has been produced with a view to meeting the unemployment which is rife in the architectural and surveying professions. Starting with the principle that the best of all ways to assist those who are in need of help is to employ them in work which will be of real service to the community, but which would not in ordinary circumstances be undertaken at the present time, the committee have evolved a scheme for the organisation of a series of civic surveys. These would consist in collecting and recording in an easily accessible manner such data, in respect of the area concerned, as are required in order to attain a complete and comprehensive knowledge of the whole of those interests, upon the preservation or enhancement of which, in their corporate or civic aspect, depend the welfare, in the broadest sense of the word, of the inhabitants. The committee have formulated definite proposals which are embodied in a memorial to the Professional Classes sub-committee of the Government Committee on the Prevention and Relief of Distress, and they ask for a substantial grant from the Prince of Wales's Fund to enable them to initiate the work. It is proposed that those engaged on the work should receive a payment by way of remuneration rather than relief, the average rate suggested being £2 a week, and it is estimated that a sum of about £10,000 would be sufficient to provide employment for about 170 men for a period of six months.

As regards the scope of the proposed surveys, it is suggested that for each area a series of graphic diagrams should be prepared showing for the whole area and for separate districts: (1) Physical characteristics of the area; (2) vital statistics as to death and disease for, say, fifty years; (3) density and growth of population; (4) provision of playing fields, recreation grounds and parks, and centres of recreation; (5) character and growth of industries; (6) extent to which present traffic needs are met, and forecast of probable future requirements; (7) conditions under which housing areas have been developed in the past, and a comparison with newer views in the laying out of building estates. The letter points out that, broadly speaking, there may be said to be two reasons why it is desirable for the inhabitants of any town to have access to an ordered record of their corporate interests: Such a record stimulates the individual citizen to take a wider interest in his city as a whole: and, by directing his attention to those assets in the life of the community, the value of which he may not, owing to his concentration in his own occupation, have had an opportunity in the past of fully appreciating, places him in a better position to form a reasoned and balanced judgment on those occasions when, owing to development in any direction, a readjustment is proposed in any of the existing arrangements of his town. Further, such a record not only enlightens the judgment of the main body of citizens, but also enables their technical advisers who may be charged with the task of elaborating and carrying out improvements in town planning to provide for a just compromise between the various elements, intellectual and material, which may be affected by new arrangements. Having regard both to the undoubted utility of the proposed work, and also to the need for some relief to those who would be employed in it, we cordially hope that the necessary financial assistance will be forthcoming either from the Prince of Wales's Fund or some other source.

* * *

The Remuneration of Architects.

The broad lesson to be drawn from a very able paper on "The Law as to the Remuneration of the Architect," read by Mr. A. Montefiore Brice at the last meeting of the Society of Architects, is that, whenever it is possible to do so, the matter should be the subject of an express contract with the client. This is at once the simplest and surest way to avoid future trouble, and in the absence of such an agreement the right of the architect is limited to the receipt of such remuneration as is reasonable in all the circumstances of the case. The question then generally arises as to whether the scale of charges laid down by the Royal Institute of British Architects is either in itself reasonable, or so well known and recognised as to amount to a custom upon the footing of which the contract must be taken to have been entered into by both parties. To neither of these questions can there be given any definitely affirmative answer applicable to all cases. The safest course for the architect is therefore, as stated by Mr. Brice, expressly to agree with his employer that his payment shall be made upon the basis of the schedule of charges as drawn up by the Royal Institute of British Architects, supplemented, where necessary, by Ryde's scale. Dealing with those charges of an architect which arise directly out of the building contract, Mr. Brice clearly indicated the legal principle underlying the absence of any liability on the part of the building owner to pay for unaccepted competition designs. Such drawings are regarded as mere estimates, and are on the same footing as drawings submitted for approval for which no remuneration is due in the absence of any agreement to the contrary. If, however, such plans are used at all, even if the architect is not engaged to superintend the work, he is entitled to be paid a fair fee for them. In regard to matters outside the building contract—such as the making of surveys, the measurement of completed work, or the preparation of bills of quantities—the architect is, in the absence of an express or implied agreement for a fixed or ascertainable sum, only entitled to charge what is reasonable. It must always be borne in mind, however, that if the architect's work is unskilful, or useless for the purpose for which he was employed, he is not only not entitled to any remuneration, but he may also be liable in an action for negligence.

* * *

Langport Council and their Surveyors.

"Another surveyor resigns" was the heading that caught our eye in a *Somerset County Herald* report of a recent meeting of the Langport Rural District Council. It appeared from the discussion that the assistant surveyor for the Eastern District had resigned, and that it was not so very long since a prior vacancy had occurred from a similar cause. Some of the rural councillors were beginning to be a little concerned about these resignations, and one of their number proposed that the council should go into committee at the close of the meeting and discuss the whole matter, but this was lost. The chairman, Mr. W. Rowe, thereupon told the members he was certain they would never get a surveyor who would stay with them [illegible]

amount they offered. This amount was not stated, but on referring to THE SURVEYOR of January 22nd last we find the Langport Rural District Council were then seeking an assistant surveyor at a salary of £75 per annum. This advertisement had reference doubtless to the other resignation which the reporter had in mind when writing his headline. The Langport Rural District Council, in fact, did not hesitate to offer to a professional man some duties responsible and multifarious enough which a portion of two or three years' experience would consider barely an adequate salary. It is little wonder in such circumstances that, as one councillor put it, "they might as well be without an assistant surveyor, for no sooner had they got a man there and he knew the roads than he was off again." This view seemed to appeal so strongly to the meeting that they passed their present difficulty, and resolved to discuss the matter in committee. What their decision was does not appear. What it ought to have been is too obvious to any fair men who are without bias to need to say.

* *

"The Surveyor" and Exhibitions.

By way of preface to the following paragraph it is desirable to recall here certain data with regard to this journal's successful promotion of exhibitions of road-engineering materials and appliances. We claim to have originated the idea of these specialised shows when in 1897 we filled a single bay at the Agricultural Hall with loan samples of road-making stones. Since this modest attempt we have organised these exhibitions biennially on a gradually growing scale of completeness which of late has necessitated the use of the whole of the extensive gallery of "Olympia." And in connection with these exhibitions we have arranged conferences at which have been discussed by experts the latest phases of roads improvement and administration questions. At the particular conference held under the presidency of Sir James Wolfe Barry, the first effort of the kind was made, with gratifying results, to substitute union for antagonism in the relations of road engineers and road users, a course which was certainly an important factor in paving the way to the creation of the Road Board. THE SURVEYOR, with the invaluable aid of Mr. E. J. Lovegrove and H.M. Geological Museum, was privileged to place for the first time on a scientific, combined with a practical, basis, the classification of road stones; and it was the pioneer of the movement which led to the standardisation of road materials under the auspices of the Institution of Civil Engineers. It might be tedious to amplify a recital of its other activities in connection with "road roads," but those already mentioned may be accepted as proving that we have at least a prescriptive right to form and to express an opinion as to further road making exhibitions now that one is projected.

* *

The C.C.A.'s Exhibition.

Following this preface, therefore, we refer specially to the "National Road Exhibition" which, as will have been gathered from the particulars given in our last issue, the County Councils Association of England and Wales propose to arrange for the end of June next. We cannot help thinking that the most important of the reasons which influenced our 1915 year's decision to defer our own exhibition, in spite of preliminary announcements as to its being held, bear with equal force on the holding at the present time of any other such exhibition. For the conference to be associated with it we have nothing but welcome. Mr. Montague Harris, the secretary of the association, is a born organiser, and in the capable hands of himself and the efficient helpers he has gathered round him it may be taken for granted that such conference will be of the highest interest and utility, and will be admirably arranged and carried through. There are undoubtedly many questions which it can ventilate to national advantage—to wit, as examples, the engineering and financial conditions which have arisen out of the commandeering of motor vehicles by the military authorities; the possible provision of work on roads for the unemployed directly after the war, on the discharges from military service; the possible openings for machines and material for road rebuilding in the France (we hope) and Belgium, France and elsewhere on the Continent, as well as at home. But an exhibition held simultaneously with the conference obviously cannot reflect in practical shape anything new or desirable which manufacturers may be inspired to devise through suggestions evolved at the conference. These must be contrived and shown later. Meanwhile, we opine that an exhibition during this horrid year of carnage is untimely and unnecessary, and we have good reasons for holding that it will not be welcomed by potential exhibitors. Even if the County Councils Association share with Mr. Horatio Bottomley the view that the war will be practically over in June, it must be remembered that exhibitors will be called upon to make up their minds now, and there will be few (if any) among those who are in agreement with such supremely sporting optimism.

* *

The War and Appointments.

In these days of national crisis it is generally admitted that those who are serving their country should not be prejudiced to a greater extent than is absolutely necessary in regard to their professional advancement. In this connection our attention has been called to a possible injustice in the case of those holding appointments on the staffs of local authorities. In almost every instance the question of salary while on service has been dealt with satisfactorily, but a point as to promotion is in serious danger of being overlooked. Obviously, those on active service are precluded from making application for any new appointment while they are so occupied, and to that extent their position will be prejudiced. A suggestion has been made that during the war all such appointments should be filled temporarily, a well-meaning proposal which, however, evidently bristles with difficulties. We observe that at the last meeting of the council of the Institution of Municipal and County Engineers it was resolved to approach the Local Government Board and to ask them if they can see their way to advise all authorities to deal with vacant appointments in this manner as far as possible. We assume that this decision was taken after careful discussion and consideration, and we confess at once that we are at present unable to make any better alternative suggestion. We feel, however, that it may not be possible in the case of some of the more important posts to deal with the matter in this way, and, even if it were, that there would be considerable difficulty in dislodging the temporary occupant of the position. The principle of considering those on service, however, is undoubtedly a sound one, and we hope that in this or some other way it will be applied wherever practicable.

EASTER HOLIDAYS.

Owing to the necessity for going to press earlier than usual, news and advertisement matter intended for insertion in next week's issue of "The Surveyor" must reach us not later than Wednesday morning, March 31st.

School Building in Mining Districts.

GROUND MOVEMENT PROBLEMS.

Special articles in the current issue of *Kahncrete Engineering*, the excellent bi-monthly devoted to reinforced concrete as exemplified by the Kahn system, treat of the problems which present themselves to the architect and the engineer in coal mining districts of the county of Durham. In certain quarters of the county, it would seem, it has become almost impossible to erect brick buildings, subsidences having very frequently broken the back of the walls before the buildings could be occupied.

The first of the accompanying illustrations illustrates some of the effects of earth movement on the Tanfield Lea higher elementary school, where it will be observed that very serious ruptures in the masonry have taken place, indicating a movement which quite conceivably might have had serious consequences. These faults in the building developed before the school was used, and, of course, were very costly to repair.

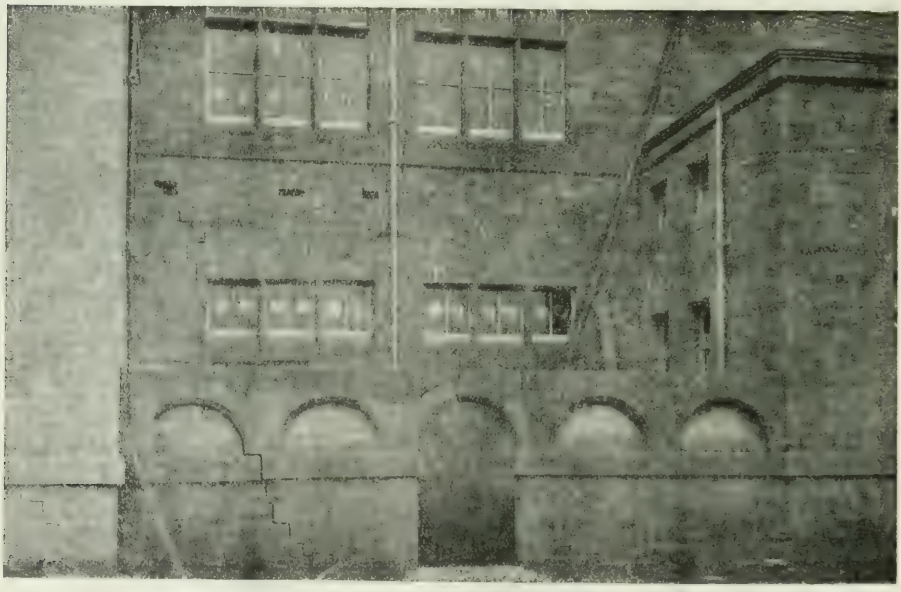
A striking instance of the difficulty of counteracting earth movement was exemplified in the new school constructed for the Education Committee at Sheldon, which was built on a very expensive concrete raft designed to form a basement to the school, and presenting an indeformable box underneath the superstructure. The school had not been open for more than six months when the raft failed, and the brick superstructure became dangerous.

The difficulty in this case was finally overcome by the erection of what is known as the Greencroft school.

It was originally intended to erect this school with bricks on concrete foundations reinforced with steel rails, and plans were prepared and estimates invited. Some doubt was entertained, however, as to the advisability of this method of construction, owing to the fact that the weight might cause surface settlements to occur. An expert mining engineer was consulted, and he recommended some form of construction which should consist of strong framing and a light method of filling in between.

Instructions were given to the architects to prepare a scheme on the lines recommended by the expert. The school was to accommodate 900 scholars in three departments—boys', girls', and infants'—with the usual central halls, cloak-rooms and teachers' rooms, while cookery and manual rooms were to be included in the scheme. The buildings are planned to form a square; the centre of the square forms a sheltered drill yard, and the classrooms are grouped round this quadrangle. Classrooms, &c., are also placed on the outside of the square, being divided from the inner classrooms by a wide top-lighted corridor. The teachers' rooms are on the first floor. The illustration gives a good idea of the general grouping of the building.

Exhaustive inquiries were made into the various forms of construction on the market, such as hollow bricks, slabs, thin bricks with wire reinforcement, various metal lathings, &c., and after going into the merits of each the architects recommended that Hy-Rib form of construction would meet the requirements, owing to its strength, lightness and rigidity. The plans were submitted to the Board of Education, who approved the entire scheme without any amendments, and signified that the school would be considered as a permanent structure, and not of a temporary character.



Detail of Tanfield Lea School, showing Cracks in Masonry.

The vegetable earth was removed, and excavations were made to the stiff clay subsoil for a level foundation. At each point below a stanchion a small block of concrete was placed, and a similar block was placed midway between, so that a deal level was obtained for the foundations of steel girders. Each girder was designed to carry the full weight from stanchion to stanchion, without the intermediate support. Stanchions were then erected at the corners of each classroom, or wherever required; on these stanchions channel-irons were bolted from corner to corner, thus forming a strong framed skeleton structure upon which the usual wood and slated roof was constructed. Intermediate rails were erected to carry flat roofs and corridors.

The filling in to partitions and outside walls was all of the scantlings—viz., 6-in. by 2-in.—these being securely fixed to the foundations, and roof girders were placed about 4 ft. centres, to suit the door and window openings, which are of the usual type. Great care and forethought were exercised to insert grounds for dado and picture rails, cloak rails, bearers for lavatory basins, vents, &c. The economy resulting from these provisions is quite apparent.

The whole outside and inside surfaces were then covered with Hy-Rib, which was easily fixed by the plasterers. The exterior was then coated with cement ½ in. thick, and finished with Derbyshire spar dashed on.

The interior was coated with plaster, and finished smooth, afterwards receiving two coats of washable distemper. Wood dados were placed round all the rooms, particular attention being given to deaden the space between the wood dados. But this precaution would not have been necessary had the walls been plastered to the floor on Hy-Rib.

Owing to the slope of the site it was necessary to form three floor levels. No difficulty was experienced in having the whole of the work erected and finished, including the fixing of Hy-Rib, by local workmen, and the final result was exceedingly satisfactory, and has called forth commendation from many quarters.

STREET CLEANSING IN CANADA.

CALGARY'S MOTOR VEHICLE EQUIPMENT.

The city of Calgary has about 1,300,000 sq. yds. of street pavements covering in the neighbourhood of 54 miles of streets. The equipment for street sprinkling and flushing (states the *Canadian Engineer*) consists of four horse flushers, four rotary brooms, two squeegees, five horse sprinkling tanks, and two 5-ton electric motor trucks.

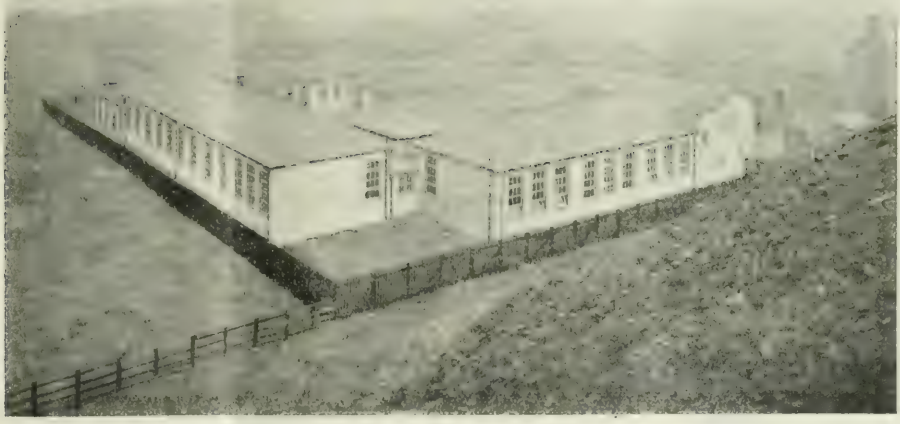
The total motor vehicle equipment consists of eight electric trucks. Besides the two just mentioned, there are two 3-ton trucks for the waterworks and stores department, one 5-ton truck for the sanitary department, and three 1-ton trucks for the electric light and street railway department.

With respect to the electric sprinklers and flushers, it is stated that during the season of 1914 they saved the city nearly £5 a day in the cost of watering streets. They were operated nine hours in the daytime for sprinkling and eight hours at night for flushing. They averaged 38 miles each per day and 17 miles each per night. They used 5s. 6d. worth of electric power per truck during the seventeen hours. In addition to this saving, the other six motor vehicles showed similar economy, and it is the intention of the city to replace horse-drawn equipment with motor trucks for all municipal work.

REFUSE REMOVAL IN THE METROPOLIS.

DIFFICULTIES OF TRANSPORT.

At Wednesday's meeting of Camberwell Borough Council the Works Committee reported the receipt from the town clerk of Bermondsey of a letter stating that, as a result of the Government commandeering barges and railway trucks for the purposes of the war, large accumulations of street refuse 12 ft. in height had been allowed to remain on the contractors' premises. The contractors had failed to succeed to remove the material. Some of the accumulation dates back to November, and possibly earlier, and it was intimated that a similar condition of things existed at the council's wharf, where two barge loads had been lying for months. The letter pointed out danger of this from the public health point of view, especially with the approach of warmer weather, and asked the Camberwell Council to concur with the action taken by the Bermondsey Council in making representations to the Government and to the railway companies requesting, in the interests of the public health, that greater facilities should be afforded for a prompt and effective mean of getting rid of the street and house refuse by releasing sufficient barges and railway trucks for this purpose.



School at Greenroff Built Entirely of Hy-Rib Cement Walls.

The Works Committee also reported that a letter had been received from the town clerk of Islington making a similar complaint of the shortage of trucks and consequent accumulation of large quantities of refuse at the council's depots. Every effort had been made to dispose of the refuse, but without success. While it was recognised that the Government should have a sufficient supply of trucks to enable the war to be successfully prosecuted, it was considered to be vital to the health of the community that the necessary facilities should be given for the prompt removal of the refuse, and representations had been made to the Government accordingly.

A Glossary of Road Terms (By H. Percy Boulnois, M.INST.C.E., St. Bride's Press, Limited, 24 Bride-lane, E.C., Price 2s. nett).—The movement towards standardising the principal roads throughout the United Kingdom has rendered it necessary to correlate the nomenclature of road terms in use in different districts, and Mr. Boulnois has compiled a glossary with the hope that it may form a basis for such a correlation.—*Times Engineering Supplement.*

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MALDENS AND COOMBE SEWAGE WORKS EXTENSIONS.

For some considerable time, owing to the rapid growth of the population of the district, and to the undertaking generally being out of date, the effluent at the sewage works of the Maldens and Coombe Urban District Council had been unsatisfactory. The council called for a report on the matter, which the engineer and surveyor, Mr. R. H. Jeffes, Assoc.M. Inst.C.E., presented in January, 1909. The proposals made were from various causes not immediately acted upon. Nothing further was done until July, 1910, when, in consequence of complaints from the Thames Conservancy, the council decided to carry out some partial measures to improve the effluent from the works. On the recommendation of the engineer and surveyor, one of the sedimentation tanks was increased in depth to 8 ft., and a new percolating filter, 80 ft. diameter, installed. The new work to the tank was carried out in reinforced concrete, and new channels adjoining the engine-house were constructed, a recording apparatus being also installed. The clinker in three contact beds was washed and renewed, and other improvements made. The whole of the work was carried out departmentally, and cost £1,230, the details being: Sedimentation tank, £191; percolating filter, £585; improvements to contact beds, £454. The works were opened in February, 1911. The beneficial effect of these works was at once apparent, but still further works were felt to be necessary to put the council in an entirely satisfactory position. Accordingly, in February, 1912, a further report was presented to the council by Mr. Jeffes, who recommended additional percolating filters, humus tanks, sedimentation tanks, detritus tanks, and sludge beds. These proposals were, with slight modifications, finally adopted, and the sanction of the Local Government Board was given in due course. The tender of Messrs. J. May & Sons, of Ashtead, was accepted for the sum of £6,124, and a start was made in March, 1914. The works have been well carried out, and a saving of £314 on the above sum has been made. Simplicity has been aimed at throughout, so as to obtain the greatest amount of purification with as small an outlet as possible, and generally the scheme is one which reflects the highest credit on the council's engineer and surveyor, who throughout has been unremitting in his attention to the details of the work.

Sedimentation tanks Nos. 2 and 3 have been completed in a similar manner to Tank No. 1, the walls being raised an additional height of about 4 ft. 2 in. The inlet carrier has been raised, and a new high-level outlet formed. The external walls and the division wall between the two tanks has been strengthened by reinforced concrete, the reinforcement being by means of expanded metal embedded in the concrete. The capacities of the tanks as altered are about 500,000 gallons—equal, approximately, to the present dry-weather flow.

Two detritus tanks of a combined capacity of 29,815 gallons, or about $\frac{1}{17}$th of the dry-weather flow, have also been constructed at the inlet end of tank No. 3, the interception and handling of the sludge having previously been a somewhat difficult and far from economical process.

The division walls between the tanks are of reinforced concrete, 1 ft. 6 in. thick, reinforced by expanded metal on each side. The bottoms of the tanks are formed in the shape of an inverted pyramid, with a small sump. The sludge will be emptied at frequent intervals by means of the hydraulic head of water in the tanks through two 4-in. cast-iron pipes, and pass, by gravitation, to the sludge beds, which comprise an area of about 2,100 sq. yds. The sludge beds are constructed with a layer of coarse clinker, 6 in. deep, followed by a layer of medium clinkers, 3 in. deep, and a top layer of fine clinker or sifted house refuse 3 in. deep. They are under-drained by 4-in. and 6-in. earthenware pipes, and the means is made the supernatant water which gathers over the sludge can be removed.

For additional filtration of the percolating [illegible] revolving sprinklers have been installed [illegible] 80-ft. diameter and of about 4·7 ft. average depth, and a cubic capacity of about 875 yds. The filtering medium consists of well-burnt hard, vitreous clinker of a gauge varying from 3 in. to 1 in., arranged in layers. The new high-level humus tanks, with [illegible] a capacity of 42,806 gallons, or about two hours' dry-weather flow, will afterwards arrest suspended matters in the effluent, which will then be dealt with by the four existing contact filters. Thence the effluent will pass through two low-level humus tanks for the final elimination of suspended matters. The construction of these tanks is identical with that of the high-level humus tanks.

The final effluent now obtained proves the success of the scheme. Messrs. Adams Hydraulics supplied the sprinklers and valves, penstocks and ejectors; the cast-iron pipes were supplied by the Thames Bank Iron Company; the metal for reinforced concrete by the Expanded Metal Company; clinker by the South Metropolitan Gas Company; and the floor tiles by Messrs. Stiff, of Birmingham. Mr. W. B. Buxton acted as clerk of the works, and carried out his duties in a very efficient manner.

The formal opening of the extensions is fixed for to-morrow (Saturday) afternoon.

THE LONDON BUILDING ACTS, WITH SOME SUGGESTED AMENDMENTS.*

By Osborn C. Hills, F.R.I.B.A., M.C.I.,
District Surveyor for the Strand.

This paper is submitted with the view and the hope that a new Act will shortly be prepared embodying the existing laws, by-laws, and regulations. In 1894 our present London Building Act was passed, and thereby cancelled some thirteen existing Acts which had to be read together. Twenty-one years have elapsed since then; many decisions have been given in the High Courts, some of which completely annul the intention of the Act; many amendments have been framed, some of which have become law; and it will soon be necessary to repeat the process of 1894 and pass a new Act embodying all the existing laws and regulations, with certain desired modifications and improvements. Such improvements should be the carefully considered results of the various authorities—the Royal Institute of British Architects, the London Society, the Town Planning Institute, architects, surveyors, structural engineers, builders, and property owners should now unite in preparing such improvements in the Acts as they consider essential in readiness for submission to the proper authority. The London County Council "fathered" the Act of 1894 through Parliament, and the writer believes they have already collected much material for a proposed new Act.

It is not suggested that the Concrete Institute should take the initiative in the matter, but, having already been recognised by Parliament in the 1909 Amendment Act, it should be prepared at the right time to suggest such amendments as will conduce towards sound construction on economical lines.

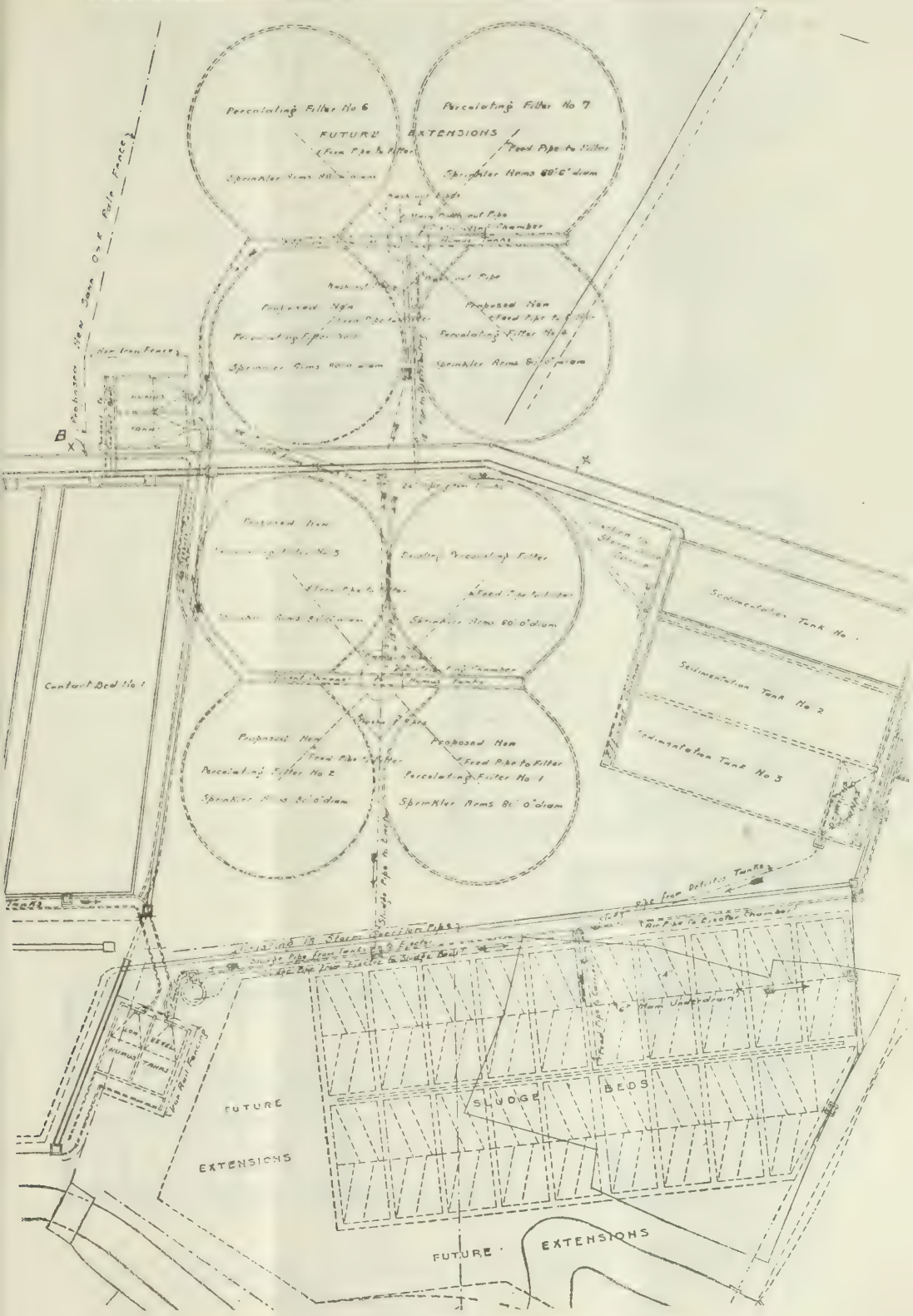
The Act should be clearly understood by all who read with average intelligence. It has to be administered by the London County Council and district surveyors. There are two important ways in which the Act needs amendment—(1) By making clear certain ambiguous and faulty wording, or wording that has been the subject of ambiguous or unsatisfactory decisions, and (2) by adding to or deducting from the existing provisions and requirements.

The chief [illegible] the Act are [illegible] (1) safety of [illegible] and protection of streets; (2) sound construction of buildings; (3) the diminution of danger arising from fire; and (4) more light, air and space round buildings.

The author then summarised the existing Acts, and made detailed suggestions for their improvement. In conclusion, he again emphasised the position which he submitted the Concrete Institute should adopt. It had already been recognised as an authority by the Legislature in the Amendment Act of 1909, and it would be ready to render able assistance when a new Act or another Amendment Act was in contemplation.

A London County Council Appointment.—It is proposed by the London County Council to invite by public advertisement applicants for the position of valuer rendered vacant by the retirement of Mr. Andrew Young. The salary offered is £1,500 a year rising to £1,800.

*Abstract of paper read at the last meeting of the Concrete Institute.


Percolating Filter No 6
FUTURE EXTENSIONS
Percolating Filter No 7
Feed Pipe to Filter
Sprinkler Arms 88'6" diam
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Proposed New Percolating Filter No 4
Proposed New Percolating Filter No 2
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Sprinkler Arms 80'-0" diam
Sprinkler Arms 80'-0" diam
Contact Bed No 1
Sedimentation Tank No 1
Sedimentation Tank No 2
Sedimentation Tank No 3
Existing Pipe from Detritus Tanks
Pipe to Effluent Chamber
Proposed New Underdrains
SLUDGE BEDS
FUTURE EXTENSIONS
FUTURE EXTENSIONS
Proposed New Iron Fence
Old Oak Pale Fence
Iron Fence
Tanks
Sludge Pipe from Tanks to Sludge Beds
Sludge Pipe from Tanks to Effluent Chamber

MALDENS AND COOMBE SEWAGE WORKS EXTENSIONS. GENERAL PLAN.

D

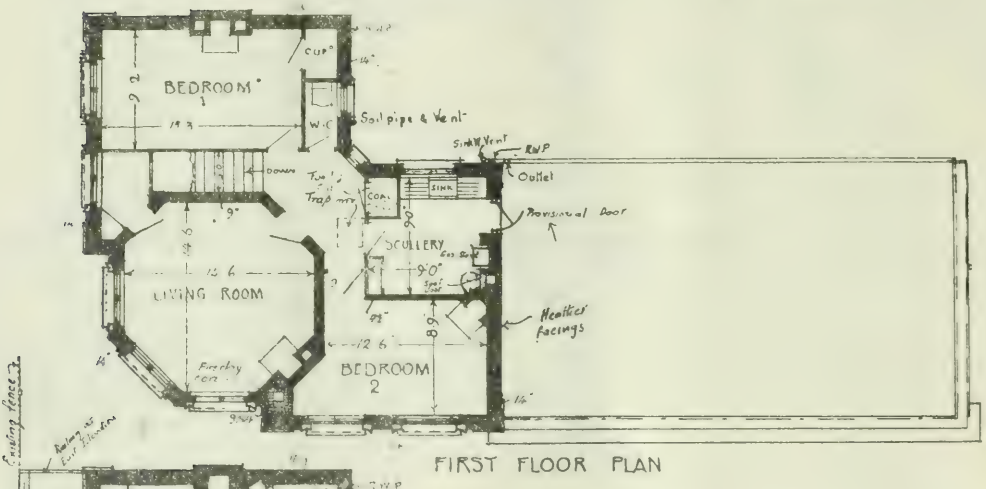
DEPTFORD SLIPPER BATHS SCHEME.

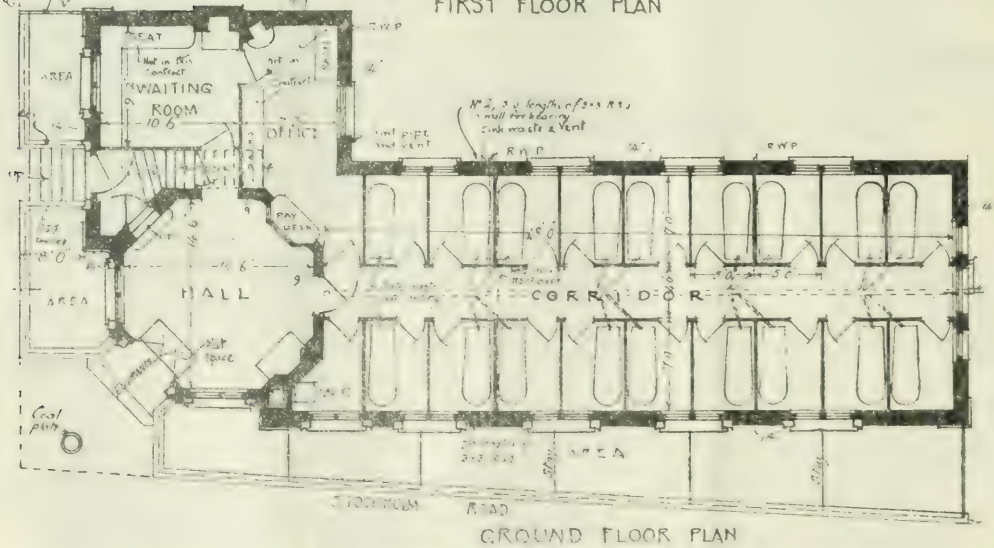
These new buildings, the foundation-stone of which was laid by the Mayor of Deptford on Saturday last, will provide for eighteen baths, for which a charge of 2d. per bath will probably be made.

The entrance to the baths will be at the corner of two thoroughfares—Ilderton-road and Stockholm-road—and will give access to a large octagonal-shaped hall. Leading from the hall there will be a waiting-room and the office, with pay desk, where the bather will obtain his towels and ticket. The bathrooms will be tiled from floor to ceiling.

On the first floor, on a portion of the site, the superintendent will live, and he will be provided with a spacious flat, containing a living-room, two bedrooms, and a kitchen-scullery.

The site itself is situated at a depth of about 10 ft. below the road level, and it has therefore been neces-





Deptford Slipper Baths.

[illegible] to [illegible] The building on piers [illegible] to bring the level of the ground floor up to that of the street.

The excavation is of red brick relieved by artificial stone dressings, and the building is constructed throughout of fireproof materials.

The baths will be of the best fireclay, supplied by Messrs. Shanks & Co., Limited. The buildings, it was stated at Saturday's ceremony, are expected to cost £2,400, a sum owing to the rise in the cost of materials 20 per cent in excess of the estimate.

The architects are Messrs. Joseph & Smith, 83 Queen Street, Cheapside, E.C., and the contractors are Messrs. W. S. Barton & Co., of Clarence Gate, W.C.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it not to be hoped that the commission appointed by the President of the Local Government Board to inquire into the sufficiency or otherwise of the existing requirements with respect to the construction, &c., of heavy motor vehicles, will take a broad view of the matter? While it is to be hoped, on the one hand, that the leaders of the country will not succumb to too rigid and restrictive regulations, on the other hand, any alterations in the present law which may be considered necessary should not only be rigidly enforced, but should be such that any vehicle using a road could not do unnecessary and excessive damage.

* * * *

Is it not rather to be regretted that the experimental lengths of reinforced-concrete road which have been constructed by the county surveyor of Kent near Gravesend have not proved satisfactory? Would it not have been rather a good thing if road engineers could have had "another string to their bow," so that if there was a "corner" in bituminous mixtures they could have fallen back on concrete. But was it not rather to have been expected that an unprotected concrete surface would fall a victim to the hammering and grinding actions of the traffic, which is considerable on the sections of road referred to?

* * * *

Is it not to be hoped that the working men of this country, who are now "having the time of their lives" as regards high wages, will not neglect to make provision for the future? Do they realise that the cost of this great war will have to be met, and that for many years to come economies will have to be practised, that there will be less capital invested in commercial undertakings, and that there will certainly have to be a reduction in employment and in the scale of wages?

* * * *

Who is responsible for the removal of temporary obstructions in the streets of the Metropolis? Is it not almost inconceivable that last Thursday a partially broken-down motor van was allowed to remain half across the footpath in Victoria-street for nearly the whole day? Is not one tempted to raise the time-worn cry of "Where are the police?"

* * * *

Should not Bermuda be an ideal place to live in when we hear, on the authority of Mr. Bertram Kershaw, in the paper he gave recently at the Institute of Sanitary Engineers, that motor cars are not allowed there? Would it not gladden the heart of some road engineers if the same restriction were in force in the United Kingdom?

* * * *

Why is it that, in the opinion of the State, a laundry-maid is of more importance than a municipal surveyor? Have we not lately seen an official advertisement asking for laundry-maids for Red Cross military hospitals, an inducement held out to applicants being that they will become "permanent civil servants of the State, and will be entitled to superannuation privileges under the Superannuation Acts"? For how many years past have municipal surveyors been agitating for superannuation privileges, which have been denied them? Is the work of a laundry-maid more important or more strenuous than that of a surveyor?

* * * *

Has not the question as to what is the proper definition of a "sanitary engineer" often exercised our minds? Shall we be much helped in a solution of this problem by a statement recently made in a paper as to the offers for the position of Government [illegible] the applicant being [illegible] a 'sanitary engineer who adds paperhanging as an additional qualification'"? Do we not know that plumbers delight to call themselves sanitary engineers? But is not this the first time that paperhangers have appeared in the lists to claim this title?

WILTSHIRE SURVEYORS' ASSOCIATION.

MEETING AT CHIPPENHAM.

The [illegible] meeting of the [illegible] Council Association was held at the Angel Hotel, Chippenham, on Saturday afternoon. Before proceeding to business the members were entertained to luncheon by the president, Mr. J. George Powell (county surveyor of Wilts), who presided, his guests including the Mayor (Alderman J. C. Coles), Mons. P. D[illegible] (Chippenham), Messrs. E. P[illegible] Dr[illegible], A. E. Adams (Chippenham), A. H. Lapham (Chippenham Rural), H. G. Nicholson Lailey (Trowbridge Urban), W. H. Stanley (Westbury Rural), C. G. M. Cross (Wootton Bassett Urban), H. [illegible] (Chippenham Rural), T. J. Huxham (Amesbury), G. Drewett (Calne), E. B. Lees (Bradford), [illegible] (Chippenham Main Roads), W. J. Godfrey (Cricklade), J. Godfrey (Calne Rural), G. Parker Pearson (Marlborough), E. P. Pearse (Melksham), [illegible] (Warminster), W. H. Long (Wilton), Mr. [illegible] (Melksham).

MAINTENANCE AND COST OF ROADS.

At the subsequent business meeting, Mr. J. G. Powell, the county surveyor of Wilts, delivered an address on the effect of modern traffic and the maintenance and cost of roads. In the course of his remarks Mr. Powell said:

Since, say, 1903 the number of mechanically propelled vehicles has increased to an alarming extent. Before that date, so far as I am able to ascertain, only some 1,100 to 1,300 motor cars were in use, whereas the number using the roads of England and Wales now (exclusive of military) is certainly not less than 250,000, and included in this large number are some 12,000 to 15,000 heavy motor cars; to the use of these I attribute the greatest injury to roads. We [illegible] enormous amount of wear and tear now compared with, say, 1903.

I am aware that a great number of motorists, including owners of heavy motor cars, also owners of traction engines, are of opinion that the main roads of the present day should be capable of carrying without injury the weights of all mechanical traffic, and assuming damage ensues—and invariably it does—the cause is attributable to defective road making or maintenance. I am not egotistical enough to say there are not some defects in road making and maintenance, but, speaking broadly and generally, the roads are judiciously and scientifically made and maintained. The [illegible] cause of damage to roads is not due to defective management, or the parsimony which is sometimes alleged to local authorities, but an omission [illegible] on the part of the Legislature.

In order to show this I must take you back a few years. In 1835 an Act, known as the Highway Act, 1835, was passed, and a number of Acts have been passed in respect of road administration. From a perusal of these several Acts, and more particularly the dates on which they were passed, it will be seen that nearly in every instance an Act in respect of the use of locomotives and other mechanically propelled vehicles on roads has preceded the Highway Act. In other words, the Legislature has legalised a traffic on the roads before they were made capable of carrying such traffic. It is inconceivable that measures so drastic should have been taken without inquiry having first been made as to whether the roads were capable of carrying the greatly increased weight of traffic. A very great injustice to the ratepayers was undoubtedly done by legalising such traffic. The roads should have been made capable of carrying it by a grant from Imperial funds before such traffic was allowed on them. This great injustice has been felt for a considerable time, resulting in a number of resolutions having been passed by various highway authorities and sent to the County Councils Association and other bodies. The outcome is that at last the County Councils Association have been instrumental in getting the Local Government Board to appoint a committee to consider the matter.

[illegible]

Auckland, New Zealand, Main Drainage.

£365,000 SCHEME INAUGURATED.

The citizens of Auckland, New Zealand, like those of all other cities in the Dominion, have given much consideration to the question of main drainage; but, owing to the city's situation on the shores of the Waitemata Harbour, no great urgency manifested itself in dealing with the problem until the development of the city and the extension of its suburbs brought the matter into prominence.

As far back as the year 1879 Mr. W. Clark, M.INST.C.E., of London, submitted to the city council a comprehensive report on the drainage of Auckland and its suburbs, after a visit paid by him to Auckland in June, 1878; the population of Auckland City was then 13,731 persons, and of the whole district dealt with by Mr. Clark in his report—viz., the City, Parnell, Ponsonby, Arch Hill, Karangahape, Newmarket, Grafton, Remuera, Eden Terrace, Newton and Richmond—26,600 persons, while the population of the provincial district was 82,490 persons.

Mr. Clark recommended the construction of upper and lower intercepting sewers, and of a pumping station, settling tanks and filters, and an outfall sewer at St. George's Bay, with provision for extension to Hobson Bay should the occasion require. No result came of Mr. Clark's visit and report, but the city council from time to time extended the existing sewers and constructed new ones in the various gullies discharging into the harbour, the sewers being in no case, however, taken below low-water mark.

In 1902 Mr. A. A. Wrigg, the then city engineer, furnished a report on the drainage of the city, expressing the opinion that the extension of the existing sewer outlets to low-water mark would render the combined system then existing in the city efficient, economical and sanitary.

In October, 1903, the council invited Mr. R. L. Mestayer, M.INST.C.E., of Wellington, to visit and report on the best scheme of sewage disposal for Auckland City, and about the same time the Auckland Harbour Board decided to prohibit the discharge of raw sewage into the harbour. Mr. Mestayer duly furnished his report in May, 1904, in which, after having dealt with the various systems of sewage disposal for cities, he made the following recommendations: (1) The re-sewering of the city on the separate system; (2) the lifting of the sewage, where necessary, by Shone ejectors, into a main intercepting sewer to be carried along the foreshore; (3) the treatment of the sewage in septic tanks, and subsequent discharge in the harbour at Cox's Creek.

Eventually it was decided to refer Mr. Mestayer's report to Mr. G. Midgley Taylor, M.INST.C.E., F.C.S. As a result of this Mr. Taylor's firm, Messrs. John Taylor, Sons & Santo Crimp, furnished a report to the city council, dated September 25, 1905, containing the following recommendations: (1) The abandonment of Mr. Mestayer's scheme; (2) the adoption of an outfall in the neighbourhood of Okahu Point; (3) the utilisation of existing sewers as far as possible; (4) the construction of a main intercepting sewer from the outfall to Cox's Creek on the combined system, or six times the dry-weather flow principle.

In March, 1906, Mr. Walter E. Bush, ASSOC.M. INST.C.E., was appointed city engineer, and prior to leaving England, he consulted with Mr. G. Midgley Taylor with reference to the latter's report, and immediately on arrival in Auckland was instructed to report upon the schemes submitted by Messrs. Mestayer and G. Midgley Taylor respectively, the report being furnished on March 26, 1907. Generally, Mr. Bush concurred with Mr. Taylor's views of the scheme prepared by Mr. Mestayer, and concluded by recommending (1) the adoption of a comprehensive scheme to embrace not only the city but also those suburban districts whose natural drainage was towards the Waitemata Harbour between Okahu Point and Motion's Creek; (2) the adoption of the broad lines of Mr. Taylor's scheme; (3) the obtaining of the consent of the Auckland Harbour Board to the direct discharge of the sewage into the sea at Okahu Point; (4) the opening up of negotiations for the acquisition of the native reserve at Orakei as a drainage reserve.

Subsequently a conference of representatives of the city council and the various suburban boroughs and road boards agreed to instruct Mr. Bush to prepare a comprehensive scheme for the drainage of Auckland and its suburbs, and further, to apply to the Harbour Board for permission to discharge the sewage into the harbour at Okahu Point. On receipt of the application the Harbour Board instructed their engineer, Mr. W. H. Hamer, M.INST.C.E., to conduct an exhaustive series of float tests, and to furnish them with a report on the advisability, from the Harbour Board's point of view, of the adoption of the scheme, especially of that portion relating to the direct discharge of sewage into the harbour at Okahu Point. At a later date the Harbour Board decided to call in the services of an independent engineer from Australia to report on this phase of the question. In view of this latter decision, and the possibility that further conflicting opinion might have been given by the engineer so engaged, it was decided, on the advice of the city engineer, to invite Mr. G. Midgley Taylor to visit Auckland so that an authoritative opinion might be obtained on the very much discussed question of the desirability of discharging raw sewage directly into the harbour.

Mr. Taylor visited Auckland in January, 1908, and, after making a careful inspection of the whole district and examining the draft scheme prepared by the city engineer, and the results of the float tests prepared by the Harbour Board engineer, he furnished a comprehensive report on the whole question, in which he expressed his approval (1) of the adoption of a joint scheme to serve Auckland City and suburbs; (2) of drainage on the combined system; (3) of direct discharge of the sewage, after screening, into the sea at Okahu Point; (4) of the line of the main intercepting sewer suggested by the city engineer. Mr. Taylor also expressed his strong opinion that the city should seek to extend its boundaries before commencing the work of main drainage, so as to embrace within its government all those districts included in the area covered by his report.

The Drainage Board, consisting of the mayor and members of the city council, which was later on set up to carry out the main lines of the scheme, appointed Mr. Bush as drainage engineer, and in September, 1909, the contract for the construction of the first section of the main sewer was let.

OUTLINE OF SCHEME.

Broadly, the scheme as carried out embodies the following main features: (1) Direct discharge of the sewage, after screening, into the sea at stated periods of the tide; (2) the intercepting of the various gully sewers discharging into the Waitemata Harbour by means of a gravitation sewer about 8¼ miles long; (3) the connection of the districts situated off the line of the main sewer by branch sewers; (4) provision for the carriage of combined sewage and storm water not exceeding six times the maximum dry-weather flow; (5) provision of pumping stations for such areas of the board's district as cannot be drained by gravitation into the board's main sewer, conditional on such districts being sewered on the separate system. The area of the board's district is 13,086 acres, in addition to which the main sewer is capable of serving the Orakei-road district and portions of the Mt. Roskill and Avondale road districts—an additional area of about 5,700 acres. The scheme is designed to serve an ultimate total population of 280,000, on the basis of six times the dry-weather flow of 35 gallons per head, or a total capacity of 98 million gallons per day.

The configuration of the district is irregular, both as regards its boundaries and general levels. Roughly speaking, the geological formation of the northern portion of the district is of yellow clay on Waitemata marl, while the southern portion of the district consists principally of volcanic scoria and lava rock. The whole district is more or less deeply indented, rendering tunnelling operations necessary on nearly every portion of the main sewer and branches, while the numerous projections to the north of the main gravitation sewer have rendered the construction of small intercepting sewers necessary.

The main outfall sewer is 1,213 ft. long, with its point of discharge situated 875 ft. north-east of the Orakei cattle jetty. For a length of 732 ft. from the point of discharge it consists of two 48-in. diameter cast-iron pipes, with turned and bored ends, fixed on cast-iron cradles at 12-ft. centres, to which the pipes are held by cast-iron straps; the cradles, surrounded with concrete, rest on a good foundation of White

[illegible] is 27 ft. below high-water mark (the board's datum), [illegible] below high-water mark.

[illegible] Bay, and have been [illegible] any future esplanade which may be made along the foreshore of the harbour; the over-all length is 1,296 ft. 6 in., and the width 106 ft., the average depth of contained liquid being 9 ft. 1 in., and the total storage capacity 7,[illegible],000 gallons. For [illegible] reasons, and in order to permit of cleansing or repairs being effected with the least curtailment of capacity, the tanks have been formed in three separate compartments by longitudinal walls running from end to end. The tanks have been constructed of concrete throughout, the outer walls on the western side and two ends being of mass concrete, 3 ft. wide, on a foundation 4 ft. wide, and on the eastern side 2 ft. 6 in. wide at the bottom, tapering to 20 in. at the top. The rest of the work is of reinforced concrete. The division walls are 12 in. wide, and the columns, of which there is a row in the centre of each tank, are 14 in. square, the total number of columns being 195. The floors vary from 7½ in. to 9 in. in thickness. The whole of the tanks have been covered by a reinforced-concrete roof, with sections set apart for roadway, carriageway and tramway tracks, should these be required in connection with any scheme for an esplanade, and a conduit has been formed in the outer wall to receive mains for gas, water or electricity.

At the south-eastern corner of the tanks are placed the screening and detritus and valve chambers, the whole being covered by a handsome brick building on a stone base, in which is installed the machinery required in connection with the screening of the sewage and the removal of inorganic detritus. A valve chamber has also been placed at the north-western corner of the tanks for controlling the discharge of sewage at the proper stated periods of tide.

MAIN INTERCEPTING SEWER.

The main intercepting sewer, when finished, will be 8¼ miles in length, of which 6¼ miles are now completed. The ruling gradient is 1 in 3,000, and the sewer has been designed on the combined or six times dry-weather flow principle. It is of standard egg-shape, or oviform section, throughout.

The first section of the main sewer commences at the storage tanks, where the sewer is at its largest cross-section, its internal dimensions being 8 ft. 6 in. by 5 ft. 8 in., with a discharging capacity of over 2,500,000 gallons per hour, or sufficient for a future estimated population of 280,000 persons at 210 gallons per head per day. It follows the curve on the beach, so as to form, if necessary, the retaining wall for the future esplanade, and is constructed of concrete, with steel reinforcement in the arch portion; from the beach it is carried in tunnel through to the eastern side of Hobson Bay, the invert and sides being of concrete and the arch of brick. The total length is 3,824 ft.

The second section of the main sewer has a total length of 6,580 ft., and is wholly constructed of reinforced concrete on reinforced-concrete piles or concrete piers, at 20-ft. centres, the sewer forming a continuous box girder. It is of similar internal cross-section to the first section—namely, 8 ft. 6 in. by 5 ft. 8 in. for a certain distance, after which the dimensions are 8 ft. 3 in. by 5 ft. 6 in. to the end of the section.

The third section of the main sewer is principally in tunnel, and is 7 ft. 9 in. by 5 ft. 2 in. internal diameters, the total length being 6,840 ft. It is of concrete throughout, concrete blocks being moulded and placed to form the arch.

The fourth section of the main sewer, principally in tunnel, is 7 ft. 6 in. by 5 ft. up to a certain point, the remainder being 7 ft. 3 in. by 4 ft. 10 in. The total length is 6,659 ft. The sewer is of concrete throughout.

The fifth section of the main sewer, principally in tunnel, has an internal diameter of 7 ft. 3 in. by 4 ft. 10 in. for a distance of 667 ft., the remainder being 6 ft. 9 in. by 4 ft. 6 in.; the total length of the section is 6,765 ft. This section contains the longest tunnel on the line of sewer—some 3,630 ft. between shafts. Its construction generally is similar to that of No. 4 section.

The sixth section of the main sewer, principally in tunnel, has a total length of 6,025 ft., the internal [illegible] 5 ft. by 3 ft. 4 in. to the end of the section.

[illegible] partially in open cut-and-cover and partially in tunnel, will have internal dimensions of 5 ft. by 3 ft. 4 in. for a distance of about 1,000 ft., thence 4 ft. 9 in. by 3 ft. 2 in., and finally 3 ft. 6 in. by 2 ft. 4 in. to the [illegible]

Overflow chambers have been provided at five points [illegible]

The scheme comprises, in addition to the main sewer, fourteen branch sewers of a total length of 79,015 ft., or, say, 15 miles, making, with the main sewer, a grand total of 23¾ miles of sewer.

In order to deal with those portions of the board's district where the general level is such that it is impossible to drain them by gravitation into the main intercepting sewer, the board will provide electrically operated pumping stations, to which sewers on the separate system will be laid by the local authorities. It is the present intention of the board to proceed with the construction of four pumping stations within the city area.

This concludes the description of the board's scheme; but, as stated, each local authority is responsible for the reticulation of its district and the connection of each with the board's main and branch sewers. The carrying out of this latter work will complete the scheme in its entirety.

The capital expenditure up to the date of the inauguration of the works—which was performed a short time ago by the Mayor of Auckland (Mr. C. J. Parr)—was, in round figures, £365,000, which includes cost of construction, engineering, inspection and administration, payment of compensation claims and legal expenses incurred therewith, and allotment for payment of interest and sinking fund, with preliminary expenses refunded to the city council and the cost of raising [illegible]

ROAD WORK IN ST. AUSTELL URBAN DISTRICT.*

By E. D. Groves,
Surveyor.

During the year the roads have been repaired and [illegible] the usual process of water-bound macadam, with stone obtained from the council's quarry at Chipponds.

Tar-spraying was carried out on several portions of the main roads, and also on the light traffic secondary roads. The cost, inclusive of all labour and materials, worked out at 1·03d. per square yard treated. Tar-spraying has a great advantage on well-constructed macadam roads. It has proved of immense benefit in the prevention of dust and mud on roads subject to heavy and rapid traffic, and adds considerably to the life of those roads, while it is a distinct advantage from a health point of view where the roads are made a playground by children.

Where tar-spraying has been done on gradients it has been found to be slippery for horse traffic at certain periods. Surface gritting is done, but this increases the production of slippery mud, as the material is crushed by the traffic.

Notwithstanding the change that has taken place in the class of vehicle on the roads at the present time, the percentage of self-propelled vehicles to the total volume of traffic in our district is comparatively small, and the difficulty has still to be faced of constructing roads that will serve equally well for the horse traffic and the self-propelled vehicles; at the same time a different method needs to be adopted in the construction of the roads so that the surface can be kept waterproof and as free from mud and dust as possible on account of the increasing self-propelled traffic.

I went fully into the question in my report of last year, and I would strongly recommend that trial lengths of road be laid down with the patent Rocmac binder. The initial cost would be slightly above water-bound macadam, but this would be more than met by the convenience and comfort of the public having clean roads during the wet season. Roads laid with Rocmac in other districts have been found to give a more lasting surface, and one which affords at the same time a most excellent foothold for horses. The great advantage of the material is that it can be laid in wet weather even better than in fine weather, and consequently the work is not interrupted as in the case of tar roads.

* Extract from Annual Report for 1914.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

Mr F. J. Manning, of Luton, has selected the following books in respect of the February premium, and they have been duly forwarded to him:—

Prof. Jamieson's "Applied Mechanics," vols. 2 and 3 (Griffin).

"Sewerage Systems," by Hugh S. Watson (Lockwood).

QUESTIONS.

This week answers are invited to the following questions:—

463. Bomb-proof Dug-out. Give sketches of a bomb-proof dug-out to hold five people. (Tico.)

466. Road Making.—Describe a few simple tests that will enable an engineer to ascertain the quality of the bitumen and filler to be used in a bituminous macadam road. (Eneer.)

467. Destructors—Forced Draught.—Discuss the relative advantages of steam jet blowers and fans for producing forced blast in destructors. (Eneer.)

468. Girder Design.—Explain a method for determining the position of the web stiffeners in a plate girder. (J. F., *Padiham.*)

469. Sewage Sprinklers. Give a good practical method of marking off the holes in the distributing arms of revolving sprinklers. The diameter of holes to be constant. (C. A. B., *Catford.*)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

465. Girder Design. What are the main points to be borne in mind when determining the [illegible] girder for any particular situation, local conditions, such as cost to be carried upon, and [illegible] appearance are the chief factors to be considered and [illegible] therefore impossible to lay down any definite rules on the subject. For instance, for most road bridges subject to heavy live load a suitable type is the solid bowstring girder. The panels to be comparatively small where a great deal of steel is to be expended. Owing to the advantage of being relatively light, and offers less resistance to wind [illegible] plate girder is sometimes used; however, as, for instance, when a lattice girder railway [illegible] by a passing train, the total wind pressure on the bridge is the same as if a [illegible] had been used. Warren or N-girders are [illegible] for bridges subject to light loads only, such as footbridges, &c. For very large [illegible] stiffening lattice girder, or a succession of cantilevers [illegible] forced concrete is sometimes given the preference [illegible] of girders in bridge work, the following are useful rules to obtain a starting-point for more exact calculations. The I section is most common for plate girders of uniform section, and the depth in feet [illegible] where S span in feet. [illegible] varies from $\frac{S}{30}$ to $\frac{S}{40}$. The [illegible] is approximately $\frac{W}{400}$ [illegible] W is the total load in tons. From these rules we can begin our calculations for obtaining more exact dimensions. The cross-sectional area of flange can be found from the formula

$$B.M. = f a d$$

where B.M. = maximum bending moment

f = safe working stress for material

d = depth of girder

a = cross-sectional area of one flange.

This formula neglects the resistance of the web to bending, but as this is only a very small quantity, as may be seen from the modulus figure of an I section, the formula is quite legitimate, and, in fact, gives an additional margin of safety. It can only be used for a girder of symmetrical section. Should it be desired to take into account the resistance of the web to bending, the formula

$$B.M. = f \frac{I}{y}$$ can be used, where

I = moment of inertia of section,

y = distance of outer fibres from neutral axis.

This formula may be used for any section of girder. Allowance must be made for rivet-holes when calculating the tension flange. Care must be taken to see that total thickness of flange (and cover-plates at joints, if any) does not exceed $4d$, where d = diameter of rivets in flange. An approximate calculation to test the web for resistance to shear is:—

Intensity of shear stress = $\frac{S}{A}$ where

S = [illegible]

A = [illegible] of web.

The above rule assumes the intensity of shear stress to be constant over the cross-section of the web, which is not the case. Should a more exact [illegible] be desired, use the rule:

Maximum [illegible] = $\frac{3}{2}$ [illegible] intensity.

In large plate girders the [illegible] happens, it [illegible] at the point of [illegible] i.e., at the ends of the cross-girders—and L or T stiffeners are riveted to the web at such points. The calculation of the exact positions at which [illegible] should be placed is somewhat a [illegible] point, but they should undoubtedly be more numerous near the abutments, where the shear stress is greatest. Bowstring plate girders are useful for large spans, but as they come under the heading of girders of uniform strength the above formulæ, &c., do not apply. They are designed so that the intensity of stress in the flanges is uniform throughout the span, the cross-sectional area of flange at any point being proportional to the bending moment at that point.

To find the [illegible] from it a stress diagram may be obtained. Should the stresses in the members prove to be inconveniently large, the depth or the number of bays may be increased, and a fresh diagram drawn. The dimensions of lattice girders when used as stiffeners in suspension bridges can be obtained [illegible] the formula:

Maximum bending moment = $\frac{W}{L \cdot S}$

.. [illegible] = $\frac{W}{10}$

where W = [illegible]

L = [illegible]

The dimensions of reinforced concrete beams vary a great deal, according to the system of reinforcement adopted: and here, again, empirical rules are

impossible. The bending moment for instance, is affected by the method of end-fastening, and in some cases is difficult of determination to any degree of accuracy.

The dimensions of a simple case can be obtained from the formulæ

$$B.M. = f_c \frac{bx}{6}(3d - x) = \frac{f_t a}{d}(3d - x)$$

where f_c = safe intensity of compressive stress in concrete,

f_t = " " " tensile stress in steel,

b = breadth of beam,

a = cross-sectional area of tensional reinforcement,

x = distance of neutral axis from top of beam,

d = effective depth of beam,

the effective depth being measured from the top of the beam to the bottom of the horizontal reinforcement.

$$\text{Also } f_c \frac{bx}{2} = a f_t$$

and for shear we have $a = \frac{W}{4d}$

where a = total area of shear reinforcement,

f_s = safe stress as ditto,

W = load on beam,

L = span,

d = effective depth of beam.

All dimensions must, of course, be modified to suit local requirements as to local traffic, etc. Of the three materials mentioned, wrought-iron and steel have for many years been recognised as reinforced concrete constructors of the highest order, developed at late largely owing to the enterprise of time making a specialty of this form of construction. Wrought-iron is given preference by some most manufacturers, basic standard specifications in the latter material only. While there is little difference as regards cost, steel can be safely stressed to 6 tons per square inch, both in tension and compression, thus giving symmetrical sections. The safe stress of wrought-iron being 4 tons per square inch in tension and 4 in compression. In a plate girder of I section, if we use wrought-iron, it is therefore necessary to make the compression flange of greater cross-sectional area than the tension flange. From the point of view of economy, reinforced concrete has much to recommend it, and in many cases it is greatly adopted for bridge structure in appropriate cases, but, since it is a comparatively new form of construction, it is safe still as yet to form an opinion as to its lasting qualities. The theories extant as to the design are not so straightforward as those with reference to structural iron and steel, to say nothing of the superior homogeneity of the latter. The material employed will depend in the main upon the type of girder decided upon, and the conditions of loading and span. (E. K., *Newport*.)

In designing a girder the first consideration is stresses and strains. Strain may be defined as the change of form of a body by the application of external forces: stress may be defined as the internal forces or resistance set up in the fibres of a body in opposing the strain. Stresses in materials are proportional to the strains, so long as there is no permanent alteration in the form of the body acted upon. The three kinds of stresses and strains are: (1) Compressive or positive stresses and strains; (2) tensile or negative stresses and strains; (3) shearing stresses and strains. (a) For spans up to 15 ft. or 20 ft., it may be assumed that beams of plain rolled section are most suitable; for spans of 15 ft. to 90 ft. plate or box girders, while beyond this limit lattice girders will generally be most suitable. Rolled beams are not suitable for long spans because from their mode of manufacture they are necessarily of uniform section throughout their entire length, and consequently much heavier at the ends than is required. A rolled beam is not of uniform strength in the same sense as a built-up girder can be made, and for this reason necessitates considerable waste of material. In practice beams are usually made I section, because the most economical section is that in which as much as possible of the metal is placed in the flanges. In girders of this form the following is an approximate formula for the modulus of the section:—

$$Z = D A + \frac{a D}{6}$$

$$= D\left(A + \frac{a}{6}\right)$$

Where B = [illegible]
A [illegible]
D [illegible]
[illegible]

(a) The following [illegible] for obtaining the allowance for the weight of girders themselves:

[illegible] $= \frac{W}{}$

Where W [illegible]
span in [illegible]
[illegible] depth.
[illegible] per square inch
[illegible] may be taken 1,200 to 1,400 for small plate girders and 1,700 to 1,900 for truss bridges.

Depth of Girder.—For plate girders the economic depth may be taken as from one-tenth to one-fifteenth of the span, and for box girders one-twentieth is often taken.

Breadth of Flange.—After fixing upon the depth of the girder, the next step is to fix the breadth of the flange, which is taken as about one-third of the depth.

Approximate Area of Flange.—Find the maximum bending moment, and decide the working stress; then

$$\text{[illegible]} = Z = \frac{M}{}$$

Using [illegible] $I = Z = D\left(A + \frac{a}{6}\right)$

Where D = depth between centres of flanges, generally taken as [illegible] centres of flanges,
A = [illegible] of the flange excluding the area of rivets [illegible] area of web,

Uniform loading $M = \frac{W L}{8}$

$\therefore$ Formulæ become

$$A = \frac{W L}{8 D} - \frac{a}{6}$$

$$A = \frac{M}{D} - \frac{W L}{8 D}$$

[illegible] deduct twice [illegible] of rivets [illegible] that in zig-zag riveting.

[illegible] has advantages over wrought iron, its strength is from 40 per cent to 50 per cent greater, and it has a proportional superiority in elasticity and ductility, though opinions upon this latter vary, some authorities holding that at present in the manufacture of steel the high-grade strength has not been accompanied with a corresponding high grade of ductility. The advantages of superior strength are great, especially in bridges of large span, as the dead load of the structure will be very much diminished. A reinforced-concrete beam is a beam in which the concrete and the reinforcing material, which we will assume to be steel, are so combined as acting together as one material, the two materials being so arranged relatively to each other as to produce a more economical material than either acting alone. Concrete is a material which is weak in resistance to tensile stresses. In designing structural work, the best material, of equal strength, to be used will be the cheapest—the artistic appearance being considered, and safety and strength being the objects in the design. Steel, volume for volume costs about fifty times concrete, and is about thirty times as strong as concrete in compression, and 300 times as strong in tension; consequently, to carry a given load in compression, concrete will cost about three-fifths steel, while for tension concrete will cost about six times that of steel. In structures, therefore, in which some portions are subjected to compression and some to tension, it is possible to obtain, by a scientific combination of steel and concrete, a more economical result than would be possible with either material separately. (E. W. P., *Southampton*.)

CORRESPONDENCE.

Ου πάντ' ὁν πάντ' ὁρᾶ
(One man does not see everything.)
- Euripides

DIRECTION POSTS.

To the Editor of The Surveyor.

Sir,—The article under the above heading by "Observer," which appeared in your issue of the 5th inst., was written without any consideration of those who have done original work in connection with this subject, except the one individual whose name is mentioned.

The motor papers, and many others, in December, 1913, described the system of semaphore signs designed by me in conjunction with one of my assistants, Mr. J. Bowen.

When discussing these signs with Mr Rees Jeffreys early in 1914 he said that no system as to what should appear on a direction arm had ever been formulated. Subsequent to this conversation, I devised the system given in the paper I read before the meeting of the Lower Thames Valley surveyors last December, that, as a rule, a direction arm should carry only two lines, the upper line that of the principal town to which the road leads and the distance thereto, while the bottom line gave the name and distance of the nearest town or village.

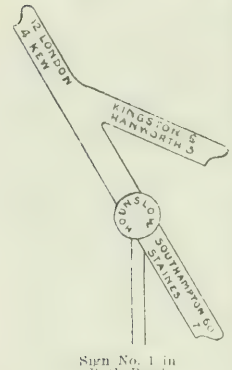
At this meeting, at which your representative was present, I exhibited slides showing my signs applying to Hounslow, and which I trust you may, in justice, now reproduce.

Fig. 2 in "Observer's" article is a facsimile of the sign I showed in the Bath road, except that "Observer" has substituted names, which destroys the value of the sign as—(1) indicating the angles of intersection of the roads to be met, and (2) either the name of the principal town or nearest town or village to which each road leads.

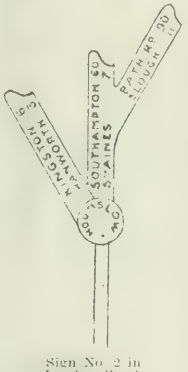
Dickens records the name of a Mr. Pecksniff who, I understand, made a somewhat similar mistake.—Yours, &c.,

C. H. Cooper, M.Inst.C.E., F.R.S.I., &c.,
Borough Surveyor, Wimbledon.

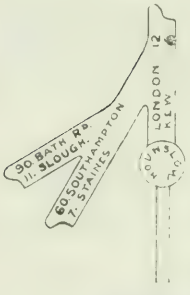
March 16, 1915.



Sign No. 1 in Bath Road.

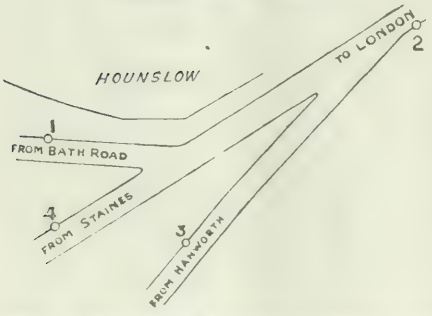


Sign No. 2 in London Road



Sign No. 3 in Hanworth Road.

Sign No. 4 in Staines Road.



THE MUNICIPAL PRACTICE OF CIVIC ART.

To the Editor of The Surveyor.

Sir,—The recent appointment of a parks superintendent for the city of Manchester is evidently about to cause a general shuffle in appointments of this nature among the larger cities of the country. This would therefore seem to be an opportune time at which to bring forward recommendations for that change of policy with regard to these appointments which must result from the broader view we are gradually adopting in this country with regard to matters of civic art. The time has gone when it was taken for granted that the dotting about in a miscellaneous manner of a few trees and shrubs and statues was all that could be expected in the way of attempts at artistic presentment within urban areas, and more extended and more universal travel has shown us not only that we are a long way behind Continental cities in this respect, but also that beauty in the city has a practical money-making value which can be reckoned in solid pounds, shillings and pence, besides contributing to the health and pleasure of the inhabitants.

It is therefore time also that we should cease to consider that the only qualifications necessary in the head of the city's public parks and gardens and open spaces is a knowledge of horticulture, or, at least, horticulture plus administrative ability, however necessary these may be. No city, not even the smallest, would think for a moment of appointing for its city architect a man whose only claim to fitness for the post was a thorough-going knowledge of the builder's trade, and yet our present policy with regard to the city's open spaces is exactly parallel to this, and, as we can all see, produces the same results. What I desire to advocate is that the position and duties of the parks superintendent in each city should merge in the larger appointment of city landscape architect, and that he, together with the city architect and city engineer, or other officer charged with the administration of the Town Planning Act, should form a triumvirate of experts, who would work together in harmony and community of aim for the æsthetic betterment of their city, chiefly, of course, by making sure that, when changes take place, control is exercised, and that they are so carried out as to add to its beauty and desirability, instead of detracting from them, as more usually happens at the present time.

It would be easy to prove that in nearly every case this æsthetic presentment can be given to necessary utilities without any increase of cost, if the matter is approached in the right way, but to do so would be to trespass unreasonably upon your space. I trust, however, that what I have said may lead to a careful reconsideration of our policy and some improvements upon current practice.—Yours, &c.,

Thomas H. Mawson, Hon.A.R.I.B.A.,
Lecturer in Landscape Design
to the University of Liverpool.

The University,
Liverpool.
March 20, 1915.

RECRUITING FOR THE FORCES.

To the Editor of The Surveyor.

Sir,—I hope you will again allow me space in your columns to communicate with your readers on the subject of service in the Forces of the Crown.

Now that we are approaching the commencement of the great struggle in Europe, it behoves every man, whatever his age, seriously to consider whether he himself is doing all in his power to support Lord

The Surveyor
And Municipal and County Engineer.

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Kitchener and the Government in their appeal to the country to organise resources. Every man who is able to join the Army should do so at once and those really unable to enlist should prepare themselves for the future, when they may be [illegible], so that the whole reserve of the nation may be called on for a great united effort.

The new Expeditionary Force and its reserve battalions are, of course, the first thought of the Government and the nation. But provided a man is keen and has grasped in true perspective the meaning of military training and service, he can find a place in the present military organisation of the country, whatever his age and whatever his capacity.

The Volunteers are being organised for those who cannot join the Regulars and Territorials, and although they occupy the last place in the military scheme, they can give real support to the Government. Every man who accepts the War Office conditions with regard to these corps thereby expresses his entire trust in Lord Kitchener, and shows that he appreciates the relative value of part-time training and full-time service.

The headquarters of the Architects' Volunteer Training Corps has now become the recruiting and equipment office for the Army, and is continuing its work of recruiting for the Royal Engineers and Sanitary Companies, both of which services are still in need of recruits. In addition to all kinds of skilled workmen, draughtsmen and surveyors can be accepted for the former, and men of sanitary experience are in demand for the latter.

The corps, which has now become the 4th Battalion (Architects) Central London Regiment of Volunteers, can offer excellent facilities for the men who are above military age, or who cannot at present join the Army.

The training centres are at St. John's Wood, Westminster and Holborn, in addition to Dulwich College, Loughton and Boreham Wood, where there are splendid areas for field exercises and manœuvring.

A school of arms has been started at Erasmus-street, Millbank, and this is open to all members who have become efficient in drill and musketry.

As a result of the War Office regulations, and some months of uncertainty, the corps is now composed of really keen men, difficulties are being met in the right spirit, and the prospects of service are most encouraging. [illegible] the [illegible] is of [illegible] to be attached to the [illegible] as possible.

All keen recruits will be most welcome, whether they come singly or as an organised body. Any corps wishing to amalgamate with and come into the 4th Battalion C.L.R. Volunteers will obtain every facility attached to the regiment, and will be able to retain its identity as far as is compatible with efficient organisation and discipline.

Join the Army at once if you can; if not, join the Volunteers. —Yours, &c.,

ALAN POTTER,
Chief Recruiter, 4th Battalion C.L.R.V.
18 Tufton-street, S.W.

ROAD TERMS.

To the Editor of THE SURVEYOR.

SIR,—I have read with considerable interest [illegible] in your last issue the definitions given by American road engineers to various materials, &c., used in road construction, and to observe that they call them "definitions," which is, of course, somewhat different to a "glossary." Most of their terms appear to agree with those used by me in my recently published "Glossary of Road Terms," but they are elaborated in some instances to greater length. Some new words are introduced, but, on the other hand, a very large number of useful words which I incorporated in my Glossary do not appear. Their definitions of asphalt and bitumen are not such as could be accepted by English road engineers without much more research and, if need be, argument. They give no fewer than eight different definitions of bituminous compounds, some of which are probably only temporary mixtures, more or less under trial. Of course, such "definitions" might be extended to any degree. The word "crown" is used to designate "camber," which, of course, could not be accepted in this country; they also use the word "grade" in the same sense. The definition of "gravel" is excellent, and much better than mine. The attempt to define "pitch" is distinctly good, and this may, or may not, be accepted in this country. On the whole, the American engineers are to be highly complimented on the excellent definitions at which they have arrived.

I can speak with some authority, as I know the difficulties I encountered in preparing my "Glossary." They may, or may not, have had the advantage of my Glossary to refer to, but I conclude that they had not seen it, as no acknowledgment to that effect is made. They give definitions of only 142 words, whereas in my Glossary I give very nearly 1,000 words. I still take credit for having started the idea of the necessity for some sort of glossary, and, having read the American definitions, I am glad to find that I was not very far wrong in my definitions, though I must confess that in some particulars they have greatly improved on them. No doubt some day, with the help of my Glossary and these American definitions, a useful technical dictionary of road terms may be produced.—Yours, &c.,

H. PERCY BOULNOIS.
7 Victoria-street, S.W.

ELECTROLYSIS OF PIPES.

To the Editor of THE SURVEYOR.

SIR,—Your recent editorial on the above subject is very much to the point, for it condenses the theory and existing safeguards into one short paragraph.

It is true that no paint, pitch, asphalt, or paper wrappings can possibly protect pipes or iron rods when subject to electric currents.

The disintegration of concrete when electricity comes into contact with water not only results in the loss of electric current, but certainly allows more ingress of dampness, and may result in severe structural defects. Indeed, it must appeal to any thoughtful person that when concrete becomes the consistency of mud—which it does when electrolysis occurs—it ceases to serve its purpose.

In condemning insulating joints you confirm the tests made by the American Bureau of Standards by saying that insulating joints are not to be relied upon as the sole means of protection, and, further, that the problem of preventing electrolysis has not yet been solved. In urging engineers to co-operate in order that everything may be done to study the subject with an open mind, you certainly appeal to them in the right direction.

My object in writing this letter is to state definitely that the subject is solved economically and definitely

by the use of waterproof concrete. The only point to watch is that the waterproofer will not affect either the tensile or compression strength of the concrete, even after prolonged periods.

It will appeal to all engineers that if concrete can be made waterproof easily and safely the danger from electrolysis is removed. In some cases it may not be necessary to waterproof the concrete, because a waterproof cement rendering would take its place, and in this way the cost will be even less.

It is not as if waterproofed cement were a new thing, because flat roofs have been waterproofed since 1908 with Pudlocd cement, and it is not as if waterproofed cement and concrete had not been tested by the highest authorities, because every Government Department is now using Pudlo in its cement. I mean by speaking of Government Departments the Office of Works, War Office, Admiralty, General Post Office, India Office, and the Crown Agents for the Colonies. All these departments are known to be extremely strict in their tests before general adoption of any material, and especially a new material. This fact alone should remove any fear or prejudice from the minds of engineers towards the use of waterproofed cement and concrete. Yours, &c.,

J. H. Kennie Gellenwood

King's Lynn.
March 24, 1915.

THE LONDON COUNTY COUNCIL AND THEIR STAFF.

To the Editor of The Surveyor.

Sir,—I noticed in your issue of the 12th inst. your article under the heading of the "London County Council and their Staff." At the conclusion of this you state that you consider the recognition of the General Purposes Committee, that we should not be allowed to represent any of the staff with regard to any grievances they might have, had some justification.

I am sure your readers will be interested to know that, as the result of our action, the original report was not only taken back by the chairman of the committee, but brought up in an amended form, by which we will be able to represent, at any rate, the clerks on the minor establishment, which at present form the bulk of our membership.—Yours, &c.,

Herbert H. Elim,
General Secretary, National Union of Clerks.

186-188 Bishopsgate,
London, E.C.
March 23, 1915.

A CANADIAN REINFORCED CONCRETE BRIDGE.

The accompanying illustration, reproduced by the courtesy of *Kahncrete Engineering*, shows a reinforced concrete bridge of the arch type, built at Port Arthur, to carry an electric railway, as well as ordinary vehicular traffic. It is of a large span, being 130 ft. between the abutments. The bridge was designed on the Kahn system by the Trussed Concrete Steel Co.

Reinforced Concrete Bridge at Port Arthur, Ontario.

MAIN ROAD PAVINGS IN THE METROPOLIS.

CAMBERWELL ENGINEER'S REPORT.

In his report for the year ended March 31st, 1914, Mr. Wm. Oxtoby, M.Inst.C.E., the borough engineer, mentions that large areas of wood-paved roads in Camberwell have survived the repayment of the original loans without any extraordinary expenditure on maintenance; but in several instances the defective condition of the paving has necessitated the relaying of the whole of the surface of certain roads, and provision is now being made each year in the estimates to deal on the same lines with some portions of the remaining areas.

In the case of the main roads, however, that the wood paving has run its life Mr. Oxtoby considers beyond question, and having regard to the marked changes in traffic occasioned by the rapid development of the motor vehicle, he regards it as essential that these highways should be entirely reconstructed at no distant date. During the past, as in previous years, large areas of the wood paving in Old Kent-road have been relaid; but, whereas in this and other thoroughfares the process of taking up, reversing and relaying the blocks on concrete has hitherto served to prolong the life of the paving, it has recently been found in this important main road that the more numerous and frequent services of motor 'buses and the ever-increasing volume, weight and speed of other mechanically propelled and heavy-horsed vehicles subjected the wood paving to such severe wear and disintegration that entire reconstruction with special dressed granite sett paving is being resorted to.

Glasgow Tramways Extension.—The Roads Committee of Upper Renfrewshire have sanctioned the proposed extension of the Glasgow Corporation tramway system from Netherlea to Clarkston on condition that the necessary road widenings are carried out.

Law Notes.

EDITED BY J. B. REGINIER CONDER, 57 Moorgate-street, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction, i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

RIVER POLLUTION—MANUFACTURERS—EFFECT OF LIABILITY OF LOCAL AUTHORITY.—The decision of the Divisional Court in *Ettrick Paper Board v. Lothburn Urban District Council* (noted ante, p. 389) has been reversed by the Court of Appeal. It will be remembered that the Judge of the Hawick County Court held that the council had not committed an offence under sec. 4 of the River Pollution Prevention Act, 1876, in permitting the flow of liquid polluted by sewage proceeding from a factory of paper manufacture. From this decision an appeal to the Divisional Court was decided that, as there was no application for an injunction, and that no sanction was required, they could not be sued under the section, but that any proceedings therein could be taken against the persons whose factory or manufacturing process was producing the noxious liquid. The Divisional Court accepted this view and reversed the decision of the County Court Judge without going into the merits of the case. The Court of Appeal overruled the Divisional Court on this point. Lord Justice Buckley said that by a Provisional Order in 1895 the Rivers Board were given all the powers and duties of a sanitary authority under the Act. The County Court Judge was of opinion that the council had been guilty of the offence charged, and gave judgment for the board. The case, appealed to the Divisional Court, and in the Divisional Court it was held that there was a defence that the water deteriorated so much that it could not be prevented, against under Part III., sec. 4, by reason of the restrictions contained in sec. 8. For himself he was not entertained the idea that the defence was raised in the Court below in the Divisional Court. The parties agreed that it was properly raised, and he thought that this Court could review the decision given upon it, because it appeared that the county court could not [illegible] clear that the judgment in the county court could not stand. They were in a position to give that court. The Divisional Court had not considered the case on its merits, and this court had nothing before them on which they could decide anything. In his view the liability of the council was not [illegible] by sec. 8 of the Act of 1876, which clearly authorised the board to bring the action against them. Therefore for the purpose of this action the council could not be made defendants unless there was an inference to be drawn from sec. 4, coupled with the restrictions contained in sec. 8, that the council [illegible] body to [illegible] to the Act. He thought he was entitled to the view that it was better that the [illegible] than that the business of a trader should be [illegible] interfered with. For that reason proceedings against a trader must be with the sanction of the Local Government Board. The result was that this appeal would be allowed with costs, and the cross-appeal against the judgment of the county court must be heard on its merits. The case was therefore sent back to the Divisional Court for this purpose.

CONTRACT—ARBITRATION CLAUSE—ALLEGED FRAUD—ACTION TO RESCIND.—An important question as to that to the effect of an arbitration clause in a contract was decided in *M[illegible] v. Bognor Urban District Council* (Court of Appeal). The plaintiff entered into a contract with the council to execute certain sewerage works for them, and one of the clauses of the contract provided that if at any time any question, dispute, or difference should arise between the council and the contractor on or in relation to or in connection with the contract, the same should be referred to arbitration, and that such submission to arbitration should be deemed to be a submission to arbitration within the meaning of the Arbitration Act 1889. While the work was in course of being carried out the plaintiff alleged that he had been induced to enter into the contract by false and fraudulent repre[illegible] plaintiff then brought this action, claiming—(1) A [illegible] for the loss he had sustained, and (3) an injunction to restrain the [illegible] dealing with his plant and material on the council's premises. The council applied to a Master for an Order staying the action on the ground that the dispute must be decided by arbitration, in accordance with the clause in the contract. The Master made the Order, and his decision was affirmed by Mr. Justice Coleridge. The Court of Appeal have now overruled this decision, and rescinded the Order to stay, on the ground that the plaintiff claimed a declaration that the contract was void, which, if proved, would render the submission to arbitration void also. The action will therefore proceed.

QUERIES AND REPLIES.

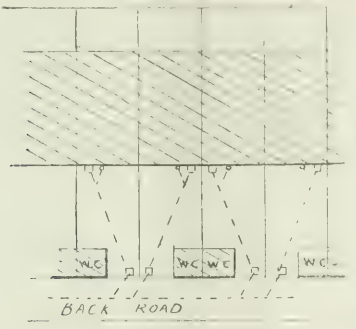
[illegible] "nom de plume." The letter X., [illegible] A Y Z [illegible] to engineer [illegible] surveyor.

[illegible] BANK.—H. V. S. writes: In an urban district a highway is situated on the side of a steep hill, and has on the lower side a wooded bank running down to a small stream at the bottom thereof. Owing to the exceptional wet weather and high winds several of the trees on the bank by the road became displaced, and the bank commenced to give way. The trees were cut down at the expense of the owner, but this has not stopped the trouble, as the roots, which are of very considerable size, are still slipping down the bank. I should be glad if you would inform me (*a*) whether the owner of the bank is liable for the support of the highway, and whether he could be called upon to provide such support where the withdrawal of it has arisen from natural causes, and through no act of his own other than, perhaps, neglect to have the heads of the trees cut down; also if, as a precautionary measure, although no evidences of trouble are showing at the present time, the council could call upon him to remove other trees which are liable to damage the road in the same way; and (*b*) should the council be liable for the new works necessary for the support of the road, which will probably be very costly, and comprise the construction of a concrete retaining wall near the stream and the making up of the bank with chalk and rubble, what powers of entry have they for this work, and what powers of user has the owner of the soil over the rubble and chalk embankment so formed? I may mention that the land, owing to the [illegible] cannot possibly be put to any use whatever by a private owner, except, perhaps, for growing timber, and it appears to me, although I have no evidence on the point, that this bank really forms a portion of the highway, and should never have passed out of the hands of the highway authority. My council is faced with a very large expense in this matter, which is one presenting many practical difficulties, and I shall be glad if you can clearly define for me the legal position before any work is done. I may add that the stream at the foot of the bank is an artificial one supplying the owner's water-mill.

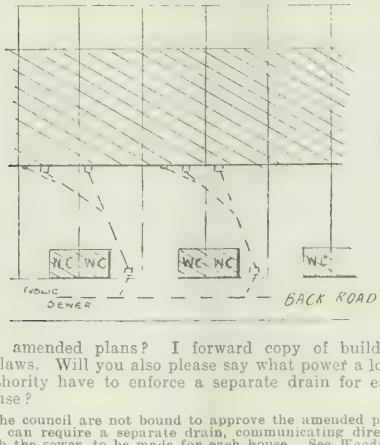
(*a*) If sec. 30 of the Public Health Acts Amendment Act, 1907, is in force in the district, and if the bank is dangerous to passengers, the council can require the owner to repair it. If the owner makes default, the council can do the repairs and recover the cost from him. But unless this section is in force the council cannot, in my opinion, call upon him to repair the bank unless they can show a prescriptive liability on his part; see *Stockport Highway Board v. Grant*, 40 J.P. 437. Under sec. 64 of the Highway Act, 1835, the owner can be compelled to cut down any tree, planted after August 31, 1835, within 15 ft. of the centre of the carriageway, and under sec. 65 he can be compelled to lop trees (with certain exceptions) which exclude sun and wind from the highway, or cause an obstruction to the carriageway. But he cannot be compelled to remove or lop trees to which these sections respectively do not apply. (*b*) Whether the bank forms

part of the highway is, I think, a question of fact, similar to the question whether a retaining wall forms part of the highway. The absence or existence of a fence separating the bank from the road, the exercise or lack of exercise by the landowner of acts of ownership, and user or non-user by the public, would be circumstances to be considered in deciding the question. Unless the bank forms part of the highway the council have no power of entry thereon without the consent of the owner.

House Drainage: Combined Drains.—"H. C. W." writes: My council have approved of plans of twelve cottages having separate back-yards, the drains of each house being connected separately with the public



sewer, as per plan A. The owner is desirous, on the ground of economy, to combine the drains of two houses, and make one connection to the sewer, as per plan B. Would my council be in order in approving



the amended plans? I forward copy of building by-laws. Will you also please say what power a local authority have to enforce a separate drain for each house?

The council are not bound to approve the amended plan, but can require a separate drain, communicating directly with the sewer, to be made for each house. See *Woodford Urban District Council* v. *Stark* (66 J.P., 536). Apparently, however, they have power to approve the amended plan if they see fit to do so. If the drains are constructed in the way therein indicated the portions from the points of junction of the separate drains will be "sewers." An agreement might be entered into with the owner that, as between him and the council they shall be considered as "drains," but such an agreement would not be binding on future owners of the houses. See *Butt* v. *Snow* (89 L.T., 302).

Sewer Repair: Damage to Gas Main.—"Drainage" writes: My council opened out an existing sewer for a length of about 200 yds. and 12 ft. deep, pulled out the existing pipes, and laid new ones in their places. While carrying out this work we came across the gas company's main, which was laid on the same line as the sewer only 3 ft. deep. We slung the pipes up with chains, and as we filled the trench up we built piers every 7 ft. or 8 ft.; also I informed the gas company what I was doing, and asked them to inspect the supporting of the pipes. This they did, and the operation was carried out to their satisfaction. After the work had been completed the gas main broke in three places through the settlement of the trench with the traffic passing over. The company have sent in an account for repairs of the same, and I shall be glad if you will say whether my council are liable for these repairs or not.

If the breaking of the gas main was due to negligence on the part of the council's workmen in not properly filling up the trench, the council would be liable for the damage. See *Cox* v. *Paddington Vestry* (64 L.T., 366; *Jacob* v. *Southend Corporation* (*Times*, December 16, 1902).

Building Line.—"Dairy" writes: This is a rural district, one parish has a population of 3,094. In this parish we wish to have a building line, as it is growing very rapidly. Will you kindly inform me how to proceed in the matter?

The powers of local authorities to prescribe a building line are very limited, and apply only to urban authorities, and to such rural authorities as have had urban powers conferred upon them by the Local Government Board under sec. 276 of the Public Health Act, 1875. Under sec. 155 of that Act, when a house has been taken down in order to be rebuilt or altered, the urban authority (or the rural authority, if this power has been conferred upon them) may prescribe the line in which it is to be rebuilt, but they must compensate the owner for any damage. And under sec. 3 of the Public Health (Buildings in Streets) Act, 1888, no building may be erected, without the consent of the authority, beyond the building on either side thereof in the same street. Sec. 155 of the 1875 Act, it will be seen, does not apply to new buildings erected on a site not previously built on. And the Act of 1888 is defective to this extent—that there is no control over the first building in the street, which may thus fix the line for the other buildings. And no by-law can be made giving the authority power to fix a building line (*Robinson* v. *Barton Eccles Local Board*, 48 J.P., 276). I presume that a scheme under the Housing and Town Planning Act, 1909, might contain provisions as to a building line, although, curiously enough, this is not one of the matters specifically mentioned in the fourth schedule to the Act, unless it can be deemed to be included in the item "buildings, structures, and erections." But this schedule is not exhaustive.

Water Supply: Supply by Meter.—"S. and E." write: We shall be glad if you will kindly let us know whether consumers of water in the Metropolitan area have the right to demand that they shall be charged for their water on the basis of measurements by meter or whether they are bound to pay on the basis of the rateable value of the premises. The particular place we have in mind is a large drapery store, and any information you can give us will be much appreciated.

The rights of consumers of water in the Metropolitan area depend upon the provisions of the special Act applicable to the particular district. In every district the charges for a supply for "domestic purposes" are based upon rateable value, and in none can a supply by meter for "domestic purposes" be insisted on. As regards water for other than domestic purposes, in some districts a consumer can require a supply for other than "domestic purposes" by meter; in others such supply can only be required upon such terms and conditions as may be agreed upon between the consumer and the Water Board. Where the use of water is in its nature domestic, the supply is for "domestic purposes," notwithstanding that its use may be ancillary to the carrying on of a business, or that the existence of a business may necessitate an increased supply for domestic purposes. See *Metropolitan Water Board* v. *Avery* (29 T.L.R., 713).

Kesteven County Council's New Offices.—It was stated at a meeting of the Kesteven County Council on Wednesday that a site for the council's new offices in Sleaford market place had been purchased for £1,925.

Refuse Disposal at Maldens and Coombe.—Tomorrow (Saturday) is fixed for the digging of the first sod in connection with a refuse destructor which is to be erected on a site adjoining the Maldens and Coombe sewage pumping station. The contractors are Messrs. Heenan & Froude, Limited.

Road Improvement for Military Traffic. It was announced at the meeting of the Kesteven County Council on Wednesday that the War Office desired that 2½ miles of the Bridge End-road should be placed in a condition to carry heavy guns on their way to and from the coast. The cost—£1,200 per mile—would not fall on the county council, and after the road was passed as satisfactory, the owners of the adjoining estates would have to pay £30 per mile per annum in perpetuity for the upkeep and maintenance of the road. It was resolved that the necessary authority be given to the sub-committee to complete the negotiations.

Water Divining in East Suffolk.—The Health Committee of the Bosmere and Claydon [illegible] Rural District Council recently had before them specifications for the construction of wells in connection with proposed supplies of water to Barking Tye and Creeting Bottoms, and it was resolved to recommend the employment at a fee of two guineas per day, of a water diviner to inspect the areas with a view to ascertaining the points at which water was most easily obtainable by sinking. It was further recommended that the gentleman to be engaged should be directed to make tests for water at Mockbeggar Green and Earl Stonham. After discussion of the recommendations the council has deferred the matter to allow the clerk to have an interview with the diviner.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Bollington U.D.C. (March 8th. Mr. R. H. Bickerton.)—£8,650 for works of paving in Henbank-road, Grimshawlane, Water-street and Palmerston-street. After considering the proposals the inspector said: I have heard [illegible] I propose to recommend sanction for the loan, and I think you will get it as soon as the Treasury will allow the Local Government Board to let you have the money. When that is [illegible] you must write to me at once, as after that I cannot tell what I may [illegible] the proposed [illegible] are not really done now, but necessary to bring [illegible] insanitary, the county council might do something to [illegible] I will personally write to the county surveyor and ask him to do what he can for you."

Hendon U.D.C. (March 10th. Mr. A. G. Drury).—£1,400 for works of [illegible] and £175 for the erection of a public convenience.—The engineer, Mr. S. S. Grimley, stated that the proposed convenience would be near a rifle range now under construction. No loan was sought for the range. The inspector: Why did you not pay for this convenience out of revenue? The surveyor: This building is of rather different construction to the rifle range. With respect to the proposed reconstruction of a portion of the outfall sewer, the clerk, Mr. H. Humphries, said that by arrangement with the Ecclesiastical Commissioners a new road leading out of Cricklewood-lane would be constructed, but before the works were commenced the council were advised that, having regard to the condition of the old sewer under the site of the new road, it would be wise to [illegible] a portion. The existing sewer was laid nearly forty years ago. There was a great urgency for the work, as the road it was proposed to construct formed the approach road to the artizans' dwellings, which were nearing completion. The surveyor: The sewer has practically done its bit. I should not be surprised [illegible] one or two places.

Hucknall U.D.C. (March 16th. Mr. M. K. North). £3,427 for laying out Titchfield Park, and [illegible] a caretaker's house, pavilion, and bandstand.—The park, it was stated, was a gift to the council by the Duke of Portland. Evidence with respect to the scheme was given by Mr. Parr, architect, and Mr. Bardell, florist.

Seaford U.D.C. (March 23rd. Mr. W. M. Cross).—£1,601 for works of sewerage and sewage disposal.—The War Office, it was explained, would make a contribution of £650 towards the cost of the scheme. The tender of Messrs. Godfrey Bros., Seaford, at £1,296, has been accepted for the work.

Southampton T.C. (March 11th. Mr. W. O. E. Meade-King). £1,700 for widening and improving Welbeck-avenue.—The borough surveyor, Mr. J. A. Crowther, stated that the road was an exceedingly dangerous one, and one not safe for anyone to drive over. He was of the opinion that it should be made up at once or at least as soon as possible.

Waterloo U.D.C. (March 18th. Mr. Edgar Dudley). £598 for the purchase of property for the widening of Crosby-road North, Waterloo, and £7,344 for street improvement in Seaforth-road, Seaforth.—With regard to Seaforth-road, it was stated the loan was required for street works, building sites being now cleared. It was only a matter of time before the council asked that it should be taken over as a main road.

Wincanton R.D.C. (March 11th. Mr. W. O. E. Meade-King). £1,900 for works of water supply for the parish of Shepton Montague.—Mr. E. J. H. Padfield, surveyor and inspector, testified that there was great need for an improved water supply. It was stated that it was proposed to provide for a daily allowance for each person of 15 gallons.

APPLICATIONS FOR LOANS.

Aldershot U.D.C. £736 for the erection of four cottages.

Chorley R.D.C.—£250 for laying water mains.

Congleton T.C.—£250 for sewer extension.

Darlington T.C.—£1,300 for electricity mains and services.

East Barnet U.D.C. £2,355 for making up a street.

Evesham Joint Hospital Board.—£1,000 for additions to the sanatorium.

Hayes U.D.C.—£350 for sewerage works.

Horsham R.D.C.—£3,500 for a joint hospital scheme.

Hull T.C.—£20,000 for the electricity works.

Mansfield T.C.—£1,100 for the purchase of property for street improvement.

Mirfield U.D.C.—£2,226 for street improvement.

Norwich T.C.—£400 for works at the tuberculosis dispensary.

Paignton U.D.C.—£820 for the purchase of land and the erection of unclimbable fencing.

Sherborne U.D.C.—£5,000 for the purchase of land for the erection of working-class houses.

Southend T.C.—£6,002 for making up certain roads.

Tettenhall U.D.C.—£660 for the purchase of property for road improvement.

Wrexham T.C.—£6,056 for the erection of cottages, and £4,500 for slaughterhouses.

LOANS SANCTIONED.

Bentley-with-Arksey U.D.C.—£2,640 for a housing scheme.

Blackrock U.D.C.—£1,550 for asphalt paving work, and £[illegible] for sewerage work.

Colwyn Bay U.D.C.—£250 for cemetery extension.

Hoddesdon U.D.C.—£990 for cemetery extension.

Hull T.C. £2,275 for completed [illegible] extension.

Skibbereen U.D.C.—£350 for labourers' cottages.

Southend T.C.—£2,675 for a recreation ground, an electricity sub-station, and street improvement.

FORTHCOMING INQUIRIES.

		£
	MARCH.	
29.—	**Westminster.** For the provision of a storage depot (Mr. Edgar Dudley)	475
30.—	**Ipswich.** For the provision of a hospital (Dr. W. W. E. Fletcher)	6,220
30.—	**Kiveton Park.** For works of sewage disposal (Mr. R. G. Hetherington)	
30.—	**Seisdon.** For works of sewage disposal (Mr. M. K. North)	900
30.—	**Stockton-on-Tees.** For the purposes of the electricity undertaking (Mr. H. Shelford Bidwell)	10,100
31.—	**Doncaster.** For works of sewage disposal (Mr. R. G. Hetherington)	1,063
31.—	**Pontefract.** For works of sewage disposal (Mr. P. M. Crosthwaite)	21,000
31.—	**Rowley Regis.** For works of sewerage (Mr. M. K. North)	1,500
31.—	**Sheffield.** For the purposes of street improvement and the electricity undertaking (Mr. H. Shelford Bidwell) ...	105,186
	APRIL.	
1.—	**Reading.** For street improvement (Mr. Edgar Dudley)	2,990
1.—	**Wincanton.** For works of water supply (Major J. Stewart)	250
7.—	**Brixham.** For the purposes of a hospital (Dr. W. W. E. Fletcher)	300
7.—	**Whitstable.** For the purchase of land at West Beach (Mr. Edgar Dudley) ...	300
8.—	**Brentford.** For road improvement (Mr. M. K. North)	10,914

The Treasury and Public Loans.—Recently the Lords Commissioners of the Treasury declined to sanction a loan for street widenings at Coventry. On Wednesday they intimated to the Education Committee that they were unable to approve the raising of loans for the enlargement of two schools. Another scheme on hand is the building of a technical institute. The City Council Committee decided to ask the Treasury to receive a deputation on the subject to hear reasons why sanctions to loans for these works should not be withheld.

Municipal Work in Progress and Projected.

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The following are among the more important projected works of which particulars appear below:—Buildings—Barnsley, Devon, Dundee, Horsham, Manchester, Swansea; housing and town planning—Liverpool; roads and materials—Devon, Hexham; sewerage and sewage disposal—Knaresborough, Stoke-on-Trent; water, gas and electricity—Darlington.—Particulars of other projected works will be found in our "Local Government Board Inquiries" price.

BUILDINGS.

Barnsley T.C.—Tenders aggregating £22,465 have been accepted for the erection of a new town hall and municipal offices on a site in Church-street.

Bournemouth T.C.—Negotiations are in progress for the purchase of a site for a secondary school for girls.

Bradford T.C.—Subject to the approval of the Local Government Board, a scheme has been passed by the Health Committee for the erection of a small-pox hospital.

Chelmsford T.C.—The Education Committee proposes to build a school at South Primrose Hill.

Devon C.C.—It is proposed to spend £10,000 on a proposed technical school for Barnstaple, £10,000 for a similar purpose at Torquay, £2,200 for a small-pox hospital (in substitution for the £1,000 approved in December), and £17,500 on the proposed institution for the care of the mentally defective.

Dundee T.C.—The central improvement scheme, embracing the erection of a city hall, came before the council last week, when a resolution was passed in favour of the promotion of a Provisional Order for a loan of £100,000 to build wings of business premises on the ground now being cleared under the Improvement Act. To objections raised in regard to incurring capital expenditure at the present time, the town clerk said they would be safeguarded by the Treasury arrangement providing that there should be no fresh capital expenditure during the war and for a year afterwards, and his opinion was that they would only get the powers needed if the scheme was prosecuted as a whole.

Horsham R.D.C.—It has been agreed to join the urban district council in the provision of an isolation hospital, at an estimated cost to the rural council of £3,500.

Isle of Wight C.C.—An agreement has been reached to purchase the premises and site of the Swan Hotel, Newport, for £1,400, for the purpose of county offices.

Manchester T.C.—The Baths Committee have again discussed the proposed scheme for public wash-houses referred back by the city council at its last meeting. In view of the fact that the Treasury will not sanction loans for increased capital expenditure, the committee was unable to take any further action for the time being.—It is proposed to build industrial schools at Cheadle Hulme, at an estimated cost of £38,000.

Rowley Regis U.D.C.—A tender, at £1,459, has been accepted for the erection of a technical school at Old Hill.

Saxmundham U.D.C.—The Local Government Board having refused to sanction a loan for the purchase and adaptation of premises for fire brigade purposes, the council have decided to purchase the property and carry out the necessary work at the cost of the general rate.

Sedgley U.D.C.—The surveyor, Mr. F. W. Farton, has been instructed to proceed with the scheme for the erection of a mortuary.

Stirling T.C.—The burgh surveyor, Mr. A. H. Goudie, has prepared plans for a public convenience in Torbrex-lane.

Surrey C.C.—Tenders have been accepted for the erection of dispensaries at Richmond, Horley and Epsom.

Swansea T.C.—Extensions are to be carried out at the technical college at an estimated cost of £22,000.

Wilts C.C.—The Public Health Committee have approved of plans for the extension of the Calne isolation hospital, at an estimated cost of £200.

Woking U.D.C.—It has been agreed to subscribe one-sixth part of the estimated cost (£3,100) for the reconstruction of Hermitage Bridge, on the direct road between Woking and Aldershot. The plans of the structure have been prepared by the surveyor, Mr. G. J. Wooldridge.

HOUSING AND TOWN PLANNING.

Camborne U.D.C.—The proposed housing scheme has been abandoned until after the war.

Congleton T.C.—The borough surveyor, Mr. J. H. Walters, has received instructions to prepare a scheme for the erection of twenty working-class houses.

Foleshill R.D.C.—It is proposed to build working-class dwellings at Foleshill and Bedworth.

Liverpool T.C.—The Housing Committee have received from Mr. Henry Hartley, the assessor, his awards on the competitive designs sent in anonymously for the workmen's dwellings proposed to be erected by the corporation in the Rathbone-street area. The second competitor out of a very long list proves to be an official in the service of the town council: First prize (£100), Messrs. Biram & Fletcher, architects, St. Helens; second prize (£50), Mr. F. E. D. Badger, Carlton-lane, Stoneycroft (Mr. Badger is the deputy building surveyor to the corporation); third prize (£25), Messrs. Halliday & Paterson and Mr. C. Gustav Agate, joint architects, Manchester. The assessor stated that his task was difficult, owing to the high standard of merit of many of the designs.

Saffron Walden R.D.C.—Application is to be made for compulsory powers for the purchase of land for the erection of working-class houses.

Neath T.C.—The council have received sanction from the Local Government Board for the preparation of town planning schemes.

Northwood-Ruislip U.D.C.—A site is to be purchased at Ruislip Common for the erection of cottages.

ROADS AND MATERIALS.

Ayrshire C.C.—After considering a report on the matter by Mr. McDonald, road surveyor, the Northern District Committee have sanctioned a grant for a road improvement on Bankhead-road, Dalry. The part of the road involved is near East Middlebank, which is very steep, and it is proposed to improve the gradient by cutting and embanking.

Brentford U.D.C.—The council have adopted a report of the Works Committee upon a conference with the Middlesex County Council with respect to the sewers under the new Great West-road. The committee stated that, after considering all the arguments raised, they could not advise the council to depart from its resolution of January last. They thought that the council should not be called upon to contribute towards the cost of making the new road, because the county council could raise loans much easier and cheaper than the council could. They pointed out that there would be a loss to the rates from the loss of the assessments of property that would be pulled down on the line of the new road, and they further recommended that the county council be asked to postpone the construction of the new road until after the termination of the war.

Bridgwater T.C.—The council have informed the county council that they approve the scheme of the proposed new road at Wembdon, but consider that their (the town council's) contribution should be considerably less than one-third of the balance, estimated at £3,515, and that the work should not be executed until after the termination of the war.

Brighton T.C.—It has been agreed to pay £1,120 for the purchase of 14 Pavilion-parade for the purpose of street improvement.

Chesterfield R.D.C.—It was reported that the final apportionment in connection with the making up of Pitt-street, Eckington, showed the total cost to be £408, of which £47 was payable by the council and £361 by the owner. In the provisional apportionment it was estimated that the work would cost £368, and that the amount payable by the council for sewering would be £35. The lowest tender for the work was £100 more than the estimate, so £60 had been saved by doing the work by direct labour.

Chester-le-Street R.D.C.—The surveyor, Mr. G. W. Ayton, proposes to commence the laying down of tarred macadam on the bus routes as soon as the weather permits.

Chippenham R.D.C.—Upon the recommendation of the surveyor, Mr. A. H. Lapham, the tender of the Cardiff Gas Company, at 46s. per ton, has been accepted for the supply of tar for the roads.

Cork T.C.—The Road Board have sanctioned a grant of £1,000 for works of road improvement.

Devon C.C.—The Main Roads Committee recommend the purchase of one steam traction engine on stone crusher and one living van, at a total cost of £880, for work on the main roads in Division 1; and two steam traction engines and four trailer wagons at a total cost of £1,200 for work on the Exeter-Okehampton main road. They further recommend an expenditure of £4,500 for main road tar-spraying.

Egham U.D.C.—It is proposed to lay new granite kerbing in Station-road.

Exeter T.C.—The tender of Mr. W. R. Bradley, St. Thomas, Exeter, at £3,236, has been accepted for the improvement of Haven-road and Water-lane.

Glamorgan C.C.—A letter from the Local Government Board with reference to the grants by the Road Board stated that it was proposed to give grants for improvements immediately required. The grants would be on a considerably reduced scale, and would be granted only in cases of roads the improvement of which could not properly be postponed. The counties should maintain the military roads in good condition, but they should spend no more than was absolutely necessary. No applications for grants for widening, diversions, new roads, and reconstruction of bridges could be considered just at present, but these should be sent forward for consideration so that the Road Board might fully consider them when they would be in a position to make the ordinary grants. County councils should not spend more than was absolutely necessary at present. The council authorised the Roads and Bridges Committee to carry out the work that is absolutely necessary.

Hexham R.D.C.—The principal footpaths in the Wylam district are to be treated with asphalt.

Kensington B.C.—At a special meeting of the council it was decided to reduce the expenditure on the maintenance and repair of the highways by £5,000 and the refuse collection by £700, during the ensuing year, so as to avoid the employment, as much as possible, of able-bodied men fit for service, and to encourage recruiting.

Kingston (Surrey) T.C.—The tender of Messrs. Stickley was on Tuesday accepted for horse hire for the ensuing year, at 10s. per day, or 6s. per half-day, for horse, harness and driver; 300 tons of granite have been purchased at 15s. 9d. per ton, and tenders have been invited for 1,700 tons.

Mytholmroyd U.D.C.—It was announced at the council meeting recently that two owners had signified their willingness to give land necessary for the widening of a section of the Burnley main road, and that there was every confidence that a third would also make a similar gift.

Paignton U.D.C.—It has been decided, subject to the consent of the Local Government Board, to purchase land at Roundham Head for the purpose of a footpath, to build a wall, and erect an unclimbable fence, at an estimated cost of £700.

Staffs C.C.—The county surveyor, Mr. J. Mouncy, and Sir Reginald Hardy have had an interview with the Road Board with regard to the proposed road widenings, improvements of the county main roads, and the applications of urban and rural authorities for grants in respect of road widenings and improvements. After considering the report submitted by them to the Main Roads and Bridges Committee, the council have decided that, inasmuch as there was not sufficient unemployment to render it necessary to put men on the roads for the sake of finding them something to do, and thus earning grants from the Road Board, it would be advisable that all the proposals, with the exception of those relating to the purchase of road materials, should remain in abeyance.

Watford U.D.C.—The council have approved the suggestion of the surveyor, Mr. D. Waterhouse, to relay Market-street with Tarmac, at an estimated cost of £500.

Winchester R.D.C.—In response to his application the surveyor, Mr. G. E. Carter, has received an intimation from the Road Board that they have sanctioned a grant of £100 for the surface tarring of the district roads. Military requisitions have been received for the repair of the roads leading to the training camps.

SEWERAGE AND SEWAGE DISPOSAL.

Clutton R.D.C.—Consideration is being given to a scheme of sewerage for Rotcombe, the estimated cost of which is £300.

Colwyn Bay U.D.C.—The Local Government Board have intimated that, while they approve (with certain minor amendments) of the proposed sewerage scheme, they consider it should be deferred for the present. The estimated cost of the works is £11,000.

Knaresborough R.D.C.—It is proposed to carry out sewerage extensions at Starbeck.

Stoke-on-Trent T.C.—The council have adopted a proposal of the Sewage Disposal Committee to acquire a new site, construct a new outfall sewer, and provide new sewage disposal works at Strongford, near Tittensor.

Thorpe R.D.C.—The council are giving consideration to a scheme for the drainage of the district.

Wellington U.D.C.—The Local Government Board in a letter to the council stated that they had considered the report of the inspector who held an inquiry recently respecting an application for a loan by Wellington Council of £9,025 for sewerage and sewage disposal. The board understood that it was proposed to purchase 6a. 2r. 8p. of land at £135 an acre, and that only a small portion of the land would be required for the scheme. They could not assent to that course. If the scheme was to be sanctioned it would be on the understanding that the surplus land would be vended by the council. A resolution was carried to the effect that a reply be sent to the board that the council would be prepared to offer for resale the land that was not required.

WATER, GAS, AND ELECTRICITY.

Brighton T.C.—It has been decided to renew the tubes at the condenser at No. 2 turbine at the South-work power station at an estimated cost of £500, less the amount to be received by the sale of the old tubes.

Darlington T.C.—It is proposed to instal new plant at the electricity works, at an estimated cost of £18,550.

Kingston (Surrey) T.C.—The following alterations have been made in the charges for electricity: The flat rate of 5d. per unit is increased to 5½d.; that supplied on the indicator system at 7d. and 3d. is increased to 7½d. and 3½d.; the supply to churches is increased from 4d. to 5d.; and 10 per cent is added for public electric lamps. No alteration is made in the charge of 1½d. for heating, cooking, and fixed motors.

Kinross T.C.—A proposal has been approved for the purchase of the local gas undertaking.

Llandilo R.D.C.—It is proposed to provide water supplies for Milo and Carmel.

Mytholmroyd U.D.C.—At the Waterworks Committee, the surveyor, Mr. S. Sutcliffe, submitted the cost of the water used by the several departments of the council. After considering this, it was resolved that the various departments of the council, in preparing their estimates for the coming year, should include in such an amount equal to the value of the water likely to be used by them. Councillor Harrison, commenting on this, said it was a new departure for each department to have to pay for its own water, yet he considered it only fair that all departments should bear their share of the burden. By adopting that system the waterworks department would show a profit of about £50.

Okehampton T.C.—A letter was read last week from the Local Government Board stating that they had considered the report made by their inspector, Mr. W. O. E. Meade-King, with reference to the council's application for sanction to borrow £106 for works of water supply in Park-row and East-street. The board gathered that all the works had been completed for some time, and, having regard to the necessity for avoiding, as far as possible at present, the borrowing of money by local authorities, they did not see how they could sanction the loan. The town clerk, Mr. J. J. Newcombe, thought he should be authorised to ask the board to alter its decision. The work was in connection with working-men's dwellings which were to be erected. The suggestion of the town clerk was agreed to.

Perth T.C.—In view of the circular issued by the Treasury as to municipal expenditure and the floating

of loans during the present crisis, it is understood that the scheme for a new water supply to Perth is to be postponed. Two of the city officials had an interview with Mr. Hogge, the engineer, at Glasgow recently in connection with the probable cost of the Stormontfield scheme.

PERSONAL.

Mr. W. B. Purser, county surveyor of Kesteven, has had his salary increased from £400 to £475 a year.

Mr. Frank W. Pownder, highways surveyor to the Watford Urban District Council, has been appointed to a position at Oxford.

Mr. G. M. Seels, New Malden, has been appointed temporary assistant in the county surveyor's department (South District), Dorset County Council.

Mr. P. C. Beeston, of Hemel Hempstead, has been appointed temporary assistant in the surveyor's department, Romford Rural District Council, at a salary of £120.

Mr. J. A. Angell, surveyor to the Beckenham Urban District Council, has received a letter of sympathy from the members of the council upon the death of his wife.

Mr. Patrick Hanrahan, borough surveyor of Wexford, and Mr. John Haworth, F.C.S., sewage disposal works, Wincobank, Sheffield, have been elected members of the Royal Sanitary Institute.

Mr. E. H. Tabor, assistant district engineer in the chief engineer's department of the London County Council, has been promoted to the position of assistant engineer at a salary of £800, rising by annual increments of £50 to £1,000 a year. The appointment follows the retirement of Mr. J. E. Worth, the assistant engineer in charge of the main drainage system on the north side of the Thames, and the council have taken the opportunity of giving effect to an arrangement approved in December, 1913, by which one officer will be responsible to the chief engineer for the effective maintenance of the whole of the main drainage system, and the supervision and design of any new main drainage works.

Mr. E. H. Habgood, acting county surveyor of Dorset, received honourable mention at the meeting of the county council recently, when Colonel Gooden, in submitting the report of the Works Committee, referred to the exceptional difficulties with respect to the abnormal rainfall, the shortage of labour, and the great scarcity of material that had to be faced in dealing with the county work. The acting county surveyor, he stated, had grappled with the difficulties in the ablest possible manner. The deputy surveyors in the north and south had been laid aside by illness, and a great deal extra work had been thrown upon the acting surveyor, and he had carried out their duties as well as his own. With respect to the remuneration of Mr. Habgood, the council decided that, as from August 1, 1914, at which date Mr. W. T. Fletcher, the county surveyor, was called up on military service, he should be paid a salary at the rate of £200 per annum, and during the continuance of the present arrangements a bonus salary at the rate of £200 per annum.

The death is announced of Mrs. Wyrill, wife of Mr. R. H. Wyrill, the borough engineer of Swansea. Mr. Wyrill, to whom we tender our deepest sympathy, has four sons, three of whom are serving with the Colours.

The final selection of the "man of push and go" to superintend the works and factories which are to come under Government control had not been announced when we went to press last night, but rumour has it that Sir George Gibb, who, it will be recollected, recently joined the Army Council with a special view to the supervision of Army contracts, will be chosen to fill the position.

FOR OTHER ADVERTISEMENTS
See End of Paper.

ROAD-MAKER. Energetic and experienced Working Engineer, familiar with tar-macadam work and tar surface treatment, required by important firm commencing road construction. State age, qualifications, experience and salary, to Box No. 1,515, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C. (2,511)

THAME URBAN DISTRICT COUNCIL.

The Council require the Services of a thoroughly competent Man to take charge of the Pumping Machinery at the Waterworks.

He must have a practical knowledge of the working of Oil Engines, Tapping of Water Mains under pressure, Detection of Waste, Inspection of Fittings, and be able to do small repairs.

Preference will be given to candidates having had similar experience under a Public Waterworks Authority.

Wages 32s. per week. Further particulars may be obtained from the Council's Surveyor, Mr. James T. Robinson, Town Hall, Thame.

Applications, accompanied by not more than three testimonials (copies only) as to character and ability, must be delivered to me not later than the first post on Wednesday, the 31st day of March inst.

CHAS. SIMMONS.
Clerk to the Council.

2 High-street, Thame.
March 22, 1915. (2,508)

ALTON URBAN DISTRICT COUNCIL.

Tenders are invited for the supply of Tarred Slag and Clee Hill Basalt. Forms of Tender may be obtained from the undersigned, and when completed to be returned in sealed envelope, endorsed "Granite," to Mr. Bradley Trimmer, Clerk to the Council, not later than April 10th. The Council do not bind themselves to accept the lowest or any Tender.

G. BERTRAM HARTFREE, F.S.I.,
Surveyor.

Town Hall,
Alton,
Hants.
March 24, 1915. (2,509)

THE SHILDON URBAN DISTRICT COUNCIL desire Tenders for the Supply of the undermentioned Materials during the year ending 31st March, 1916:—

Broken Whinstone, Slag, and Tarred Whin and Slag, from 2½ in. to fine; Concrete and Freestone Kerbs, Sweeps and Flags; Cement, Sand, Scoriæ and Paving Bricks, Sanitary Pipes, &c.; Disinfectants, Brooms, Shovels, Spades, C.I. Gullies and Manhole Covers, to be delivered at Shildon Station.

Sealed Tenders, with Specifications and Samples, to be received by 6th April.

J. ARTHUR WOOD,
Clerk.

Council Offices,
Shildon. (2,510)

BOROUGH OF HYTHE.
ISOLATION HOSPITAL.

The Corporation of Hythe are prepared to receive Tenders for the erecting of a Timber-framed and Corrugated-iron Isolation Hospital for eight beds.

Plans and Specifications can be seen, and Form of Tender obtained, on application to the undersigned.

Sealed Tenders, endorsed "Isolation Hospital," to be delivered to Bernard C. Drake, Esq., Town Clerk, Hythe, Kent, on or before 12 noon, Friday, 9th April, 1915. The lowest Tender will not necessarily be accepted.

CHRIS. JONES, C.E.,
Borough Surveyor.

Borough Surveyor's Office,
Hythe, Kent.
March 24, 1915. (2,506)

MALDON RURAL DISTRICT COUNCIL.
HIRE OF STEAM ROLLERS.

The above Council invite Tenders for Steam Rolling for the year ending June 30th, 1916.

Specification and Form of Tender may be obtained from the Surveyor.

Sealed Tenders, endorsed "Tender for Steam Rolling," must be delivered at my Office not later than Tuesday, March 30th, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

E. J. ENNALS,
Surveyor.

6 Market-hill, Maldon, Essex. (2,507)

LONDON WATER.

EQUALISATION OF STORAGE IN THE THAMES VALLEY.

In a report presented at last Friday's meeting of the Metropolitan Water Board the Water Examination Committee stated that they had given careful consideration to the alterations in the design of the Littleton reservoirs which the Works and Stores Committee are submitting to the board. The scheme involves the construction of earthen embankments with submerged slopes formed of specially prepared puddle plated, and the substitution of earthen dividing banks for the purpose of ensuring that the whole body of water is placed in motion between the inlet and outlet who never water is withdrawn.

"The original scheme," said the committee, "had several important drawbacks which cannot be overlooked. There is compensation to be provided with separate inlets and outlets, a matter to which the Director of Water Examination attached great importance, since with reservoirs of enormous size the difficulties of treatment are greatly increased if anything goes wrong. The submerged dividing embankments in the original plans were partially designed by the late Mr. Bryan with the idea of ensuring good circulation of water and the deposit of silt, and they would have effected these objects. It appears, however, that the deposition of silt in moving water is not a method which should be followed in ordinary circumstances, as it leads to the drawing out of many impurities which, under the newly proposed, settle at the bottom of the reservoir and become partially disintegrated and purified.

"The new proposals have many obvious advantages. Good circulation is obtained by a skilful arrangement of training banks, and this part of the scheme appears to be extremely satisfactory on the understanding that the upper portions of these banks are covered with concrete aprons. The total storage accommodation is also considerably increased by the omission of the central embankment, while the abstraction of foul water is prevented by the provision of an outlet tower allowing of water being drawn at any level above the sill.

Against these real advantages, however, the committee pointed out, must be set the fact that the subdivision into four reservoirs of the alternative of two positions with a central embankment originally advocated by them, were according to the present proposal reduced to one reservoir of enormous capacity with no special provision for preliminary sedimentation, and in the event of algal troubles arising it would be extremely difficult to treat so huge a volume of water. They had viewed with some apprehension the proposal for the omission of the central embankment, but, as the Works and Stores Committee had—(1) incorporated in the scheme suggestions for stopping the bottom of the reservoir so as to expose it to drying out in winter where practicable, the excavating to be as impossible, the preliminary removal of excessive growth of vegetation, (2) had agreed to afford every possible consideration to a suitable scheme for dealing with the intercepted water which it was hoped would enable them to bring forward, and (3) had favourably received a suggestion for superseding the storage in the Thames Valley, they, the Water Examination Committee, did not feel justified in pressing for the retention of the central embankment. It might be very right to state that, in the opinion of the Director of Water Examination, small sedimentation reservoirs should be interposed between the river and the large storage reservoirs, and that undue large reservoirs were to be avoided.

The Director of Water Examination had always advocated that equality of storage was most important, and in his judgment provision against drought did not necessarily involve the retention of water for unequal periods in the different reservoirs. The equalisation of storage was a matter which the committee regarded as being of cardinal importance, and they had taken advantage of the opportunity afforded by the consideration of this scheme to ask the Works and Stores Committee for an assurance that when the Littleton works had been brought into use arrangements would be made by which the water in both the Staines and Littleton reservoirs would not be subjected to a substantially longer period of storage than the average period throughout the Thames system of supply. They realised that it was essential to ensure adequate provision against periods of drought, and that times might arise when [illegible] there were certain engineering difficulties in connection with the Thames Valley works as at present designed, which rendered equalisation in these exceptional circumstances impracticable. Nevertheless, they believed that, exceptional cases apart, it was possible [illegible] the power of equalisation, and the Water and Stores Committee and the chief engineer were in broad agreement with them.

SEWAGE AERATION EXPERIMENTS IN THE UNITED STATES.

The United States Health Service and the Baltimore Sewerage Commission have completed preliminary plans for conducting jointly at Baltimore a series of experiments on the aeration of sewage. Prof. Earl B. Phelps will direct the work for the Health Service, with Mr. Leslie C. Frank in charge of the experimental plant, while the Baltimore Sewerage Commission will be represented by its chief engineer Mr. Colin W. Hastings. From Prof. Phelps and Mr. Hastings the following information regarding the scope of the work has been received by the *Engineering Record*.

Recent English results on the aeration of sewage seem to support the work which Col. William M. Black and Prof. Phelps did at Brooklyn some years ago, and to explain some irregularities which interfered with complete success. It is proposed, therefore, to co-operate those earlier experiments, making use of the activated sludge principle developed by the English workers.

One of the two tested tanks at the Baltimore works will be equally provided, so that it can be used to test the effect of aeration upon a practicable scale and to make experiments how process which is essential if practical use is to be made of the English principle.

INSTITUTION OF WATER ENGINEERS.

[illegible] at the Institution, 25, Victoria-street, Westminster, on Wednesday, the 12th inst., Messrs. J. B. Hill, R.N., geological adviser to the Local Government Board; H. H. Law, M.INST.C.E., chief engineering inspector to the Local Government Board; and P. C. Cowan, D.SC., M.INST.C.E., chief engineering inspector to the Local Government Board of Ireland.

The council also elected Mr. W. A. Walker, engineer and manager to the Hillhouse and Hamilton Water Company, as member, and Mr. G. A. Ballard, assistant borough engineer, Guildford, as associate-member.

[illegible]

The council, in view of the probability that the [illegible] at the Belfast meeting arranged for June 15th-18th next would be prejudicially affected by the war, have decided to postpone it until the summer of 1916.

A meeting will be held in London on Friday, June 18th next, for the purpose of installing the president-elect and the reading and discussion of papers, particulars of which will be announced later.

The nomination and election of officers will be [illegible] this year.

It is suggested that Mr. McCullough should be [illegible] to the presidential chair a second year, in which case his presidential address would be delivered at the Belfast meeting in June.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purposes, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

COUNCIL MEETING.

A meeting of the council of the institution was held at 92 Victoria-street, Westminster, S.W., on Saturday, March 13th, when there were present Messrs. J. S. Pickering (president, in the chair), J. Patten Barber, W. Nisbet Blair, J. A. Brodie, G. F. Carter, J. W. Cockrill, A. E. Collins, E. J. Elford, Frank Harris, T. W. A. Hayward, W. T. Lancashire, L. S. McKenzie, P. H. Palmer, W. H. Prescott, Norman Scorgie, R. J. Thomas, H. T. Wakelam, O. E. Winter, the consultant secretary, and the secretary.

THE MEMBERSHIP ROLL.

The following candidates were elected.

Members: Messrs. W. Ellis, engineer and surveyor to the Barnoldswick Urban District Council; H. Knight, deputy surveyor to the Brentford Urban District Council; N. E. Naish, chief assistant, sewerage department, Croydon Corporation; and J. P. Pike, divisional engineer to the Port Elizabeth Municipality.

Students: Messrs. H. H. Green, engineering assistant to borough surveyor, Eccles; J. Hawcroft, articled pupil to engineer and surveyor, Hoyland Nether Urban District Council; F. Cross, articled pupil to surveyor to the Northwich Urban District Council; and H. Garside, junior assistant to the Leek Urban District Council.

Transfer from Associate-member to Member: Mr. R. B. Donald, chief engineering assistant to borough engineer and surveyor, Huddersfield.

The matter of appointments on the staffs of local authorities falling vacant during the war was considered by the council, and it was resolved to suggest to the Local Government Board that they should advise authorities to fill such posts temporarily, it being recognised that otherwise officers on active service will be in a less favourable position as regards promotion and advancement than if they had not offered their services to the Crown.

COUNCIL BALLOT.

Upon the report of the returning officer and scrutineers as to the scrutiny of the ballot lists for the election of the president, vice-presidents, honorary treasurer, and ordinary members of the council, the following were found to be elected for the year 1915-1916:—

President: Mr. H. T. Wakelam.

Vice-presidents: Messrs. J. S. Brodie, T. W. A. Hayward, and P. H. Palmer.

Honorary Treasurer: Sir James Lemon.

Ordinary Members of Council: Messrs. Chas. Brownridge. E. E. W. Butt, G. F. Carter, E. J. Elford, H. P. Foster, W. T. Lancashire, E. B. Martin, F. Massie, W. H. Prescott, Norman Scorgie, H. E. Stilgoe, and C. F. Wike.

District nomination forms will be issued before the end of March.

SOUTH-EASTERN DISTRICT.

A South-Eastern District meeting is to be held at the offices of the institution, 92 Victoria-street, Westminster, S.W., to-day (Friday), at 6 p.m.

AGENDA.

(*a*) To confirm minutes of last meeting.
(*b*) To consider nominations for—
(1) District chairman.
(2) District representative.
(3) District secretary.
(*c*) To elect district executive committee.
(*d*) Any other business.

H. W. Bowen, Assoc.M.Inst.C.E.,
Hon. District Secretary.

Horsham.

SOUTH-WESTERN DISTRICT.

A South-Western District meeting will be held at the Municipal Buildings, Taunton, to-morrow (Saturday).

PROGRAMME.

12 noon.—Meet at the Council Chamber, Municipal Buildings, Taunton.
Business:—
To confirm minutes of the last meeting.
To receive communications, if any.
To decide as to nominations for district officers.
To elect a district executive committee.

1 p.m.—Lunch at the Municipal Hall, by kind invitation of his Worship the Mayor of Taunton, Councillor Geo. Hinton, J.P.

2.30 p.m. Discussion on public baths, to be opened by Mr. D. Edwards, Assoc.M.Inst.C.E., borough surveyor, Taunton.

4 p.m. Tea at the Municipal Hall, by the kind invitation of Alderman F. W. Penny, J.P., deputy mayor of Taunton.

D. Edwards, Assoc.M.Inst.C.E.,
Hon. District Secretary.

Taunton.

SOUTH WALES DISTRICT.

A South Wales District meeting will be held at City Hall, Cardiff (by the kind consent of the Cardiff Corporation), to-morrow (Saturday), at 2.15 p.m.

AGENDA.

(1) To read the minutes of the last meeting.
(2) To elect a district secretary.
(3) To receive nominations for district representative.
(4) To elect a district chairman.
(5) To elect a district executive committee.
(6) Paper by Mr. D. M. Jenkins (member), Neath: "Notes on Extraordinary Traffic on Highways."
(7) Other business, if any.

H. Alex. Clarke,
Hon. District Secretary.

Briton Ferry.

EAST MIDLAND DISTRICT.

An East Midland District meeting is to be held at the Town Hall, Loughborough, on Saturday, April 10th.

PROGRAMME.

2.15 p.m.—The members and visitors will be received in the Council Chamber by the Mayor of Loughborough (Mr. W. W. Coltman, J.P.).

2.30 p.m.—To receive minutes of last meeting.
To elect district committee.
To discuss election of district representative, district chairman, and district secretary.
To consider any other general district business.

3 p.m.—Proceed in conveyances (at a charge of 1s. per person) to inspect the swimming baths, where members will be given the opportunity of inspecting an apparatus for teaching swimming, erected by Messrs. Herbert Morris, Limited, of Loughborough.
Proceed to sewage farm to inspect refuse destructor and other works.

5 p.m.—Arrive at town hall, where tea will be provided by the borough surveyor, Mr. A. H. Walker, Assoc.M.Inst.C.E.

E. H. Crump, Assoc.M.Inst.C.E.,
Hon. District Secretary.

Hinckley.

SOCIETY OF ENGINEERS.

At a meeting of the Society of Engineers to be held on Tuesday, April 13th, at the Institution of Electrical Engineers, Victoria Embankment, W.C., a paper, entitled "Main Roads: Past and Present, and Modern Methods of Construction and Maintenance," will be read by Mr. Frank Grove, M.I.M. and Co.E., assistant county surveyor of Surrey, the following being a synopsis:

Brief history of roads from the time of the Romans to the present day—Traffic requirements immediately prior to the introduction of self-propelled vehicles—Details of road construction at that time—Effects of motor traffic on the old type of roads, and some methods employed to cope therewith—Description of a few of the modern methods of road construction and maintenance employed during recent years in the county of Surrey.

The chair will be taken at 7.30 p.m.

A. S. E. Ackermann,
Secretary.

17 Victoria-street, S.W.

EASTER HOLIDAYS.

Owing to the necessity for going to press earlier than usual, news and advertisement matter intended for insertion in next week's issue of "The Surveyor" must reach us not later than Wednesday morning, March 31st.

An Interrupted Contract.—The Metropolitan Water Board in December last accepted the tender of Messrs. R. Robinson & Co., of £5,798, for the construction of covered service reservoirs at Betsom's Hill and Westerham Hill. The Works and Stores Committee have now had before them a report by the chief engineer stating that, owing to the contractors being unable to obtain ballast for concrete, he has permitted them to suspend work upon their contract until more normal conditions prevail and granted an extension of the contract time.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BOOK-KEEPER AND STORES CLERK. March 29th.—Corporation of Harrogate. £1 15s. per week.—Mr. C. E. Rivers, borough engineer, Municipal Offices.

SURVEYOR'S JUNIOR ASSISTANT. March 29th.—Corporation of Congleton.—Mr. J. H. Walters, borough surveyor, Town Hall, Congleton.

SURVEYOR AND INSPECTOR. March 29th.—Bolsover Urban District Council. £160 per annum.—Mr. H. J. Watson, clerk, 32 Glumangate, Chesterfield.

BUILDING INSPECTOR AND CLERK OF WORKS. March 30th.—Corporation of Torquay. £130 per annum.—Mr. Henry A. Garrett, borough engineer and surveyor, Town Hall.

INSPECTOR OF NUISANCES. March 30th.—Lowestoft Town Council. £200 per annum.—Mr. R. B. Nicholson, town clerk.

ASSISTANT ENGINEERS. — April 1st. — Indian Public Works and State Railways Department.—Secretary, Public Works Department, India Office, London, S.W.

INSPECTOR OF NUISANCES. — April 3rd. — Twickenham Urban District Council. £140—£150 per annum.—Mr. H. J. Saunders, clerk.

ASSISTANT SURVEYOR AND INSPECTOR. April 6th.—Kingswood Urban District Council. 25s. per week.—The Clerk, Council Offices, Kingswood, Bristol.

SUPERINTENDENT OF HIGHWAYS. April 8th.—Corporation of Huddersfield. £130 per annum.—Mr. K. F. Campbell, borough engineer and surveyor, 1 Peel-street, Huddersfield.

DRAUGHTSMAN. For the Nigerian Government Railway. £300—£350 per annum.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

COST CLERK.—Sheffield Corporation.—General Manager, Water Department, Town Hall.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

WHITEHAVEN.—April 21st.—Competitive designs for laying out the coach road site (6 acres 1 rood 25 poles) and the erection of houses, for the town council. Premiums, 30, 20 and 10 guineas.—Mr. T. Brown, town clerk.

GALEMIRE.—Designs for a small hospital, for the Galemire (Whitehaven) Joint Hospital Committee.—Mr. E. B. Croasdell, clerk, Union Hall, Whitehaven.

STEPNEY.—Designs for municipal buildings, for the borough council. Mr. H. T. Hare, F.R.I.B.A., has been appointed assessor.—Mr. G. W. Clarke, town clerk, 15 Great Alie-street, Whitechapel.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

DUNDEE.—March 29th.—For the erection of an electricity sub-station, for the corporation.—Mr. H. Richardson, general manager and engineer, Electricity Department, Dundee.

KENDAL.—March 29th.—For the construction of walls in blue brick at the sewage disposal works, for the corporation.—Mr. F. W. Oxberry, borough engineer and surveyor.

LLANELLY.—March 29th.—For the erection of sixty-one houses, for the corporation.—Borough Surveyor.

SHREWSBURY.—March 29th.—For the erection of a urinal, bath, and other works, for the corporation.—Mr. A. W. Ward, borough surveyor, The Square, Shrewsbury.

MAESTEG.—March 29th.—For the erection of public lavatories and fire-hose station, for the urban district council.—Mr. S. J. Harpur, architect and surveyor, 32 Commercial-street, Maesteg.

LEYTON.—March 30th.—For the construction of underground conveniences, for the urban district council.—Mr. E. H. Essex, surveyor, Town Hall.

HAMMERSMITH.—March 30th.—For taking down and subsequently re-erecting the temporary floor over a swimming bath, for the borough council.—Mr. H. Mair, borough surveyor.

BRADFORD. March 30th.—For the erection of a sanatorium, for the City Architect, Town Hall.

CARMARTHEN. March 31st.—For the erection of a school, for the county council.—Mr. W. V. Morgan, county architect, County Education Offices, Carmarthen.

KIRKCALDY. March 31st.—For the construction of a concrete toe to the sloping wall in tidal basin, for the corporation.—Mr. R. Henderson, harbour engineer, 2 St. Andrew-square, Edinburgh.

LANCHESTER.—March 31st.—For additions to the sanatorium, for the Joint Hospital Board.—Mr. G. T. Wilson, architect, 22 Durham-road, Blackhill.

CLAREMORRIS.—March 31st.—For building four single and nine double cottages, for the rural district council.—Mr. J. W. Judge, clerk.

BEATH.—March 31st.—For the erection of a school, for the School Board.—Mr. G. C. Campbell, architect, Methil, Fife.

BEDWELLTY.—March 31st.—For the erection of a reinforced-concrete boiler-house, laundry, and two new blocks at the hospital, for the urban district council.—Mr. D. H. Price, surveyor, Abergoed.

HUDDERSFIELD.—April 1st.—For the erection of a shed for sand-drying plant and store shed, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

AXBRIDGE.—April 2nd.—For the construction of waterworks, for the rural district council.—Mr. A. Powell, engineer, 10 Orchard-street, College Green, Bristol.

ERITH.—April 3rd.—For the extension of the sanatorium, for the urban district council.—Mr. H. Hind, surveyor.

BLOFIELD.—April 3rd.—For the erection of six or ten cottages, for the rural district council.—The Clerk, 12 Bank-street, Norwich.

ANGLESEY.—April 7th.—For the erection of new schools, for the Education Committee.—Mr. J. Owen, county architect, Menai Bridge.

TETCRO April 5th. For the erection of a cruck turret in steel and concrete and other works, for the corporation.—Mr. E. A. Barnes, city engineer and surveyor.

CORNWALL.—April 10th.—For the erection of a school, for the Education Committee.—Mr. B. C. Andrew, architect, Biddicks-court, St. Austell.

TYRONE.—April 12th.—For additions to Dungannon House, and the erection of a pavilion and medical officer's residence, for the county council.—Mr. J. A. Hunter, Lurgan.

ASHINGTON.—April 17th.—For the erection of gas-works, for the urban district council.—Messrs. W. A. Valon & Son, Caxton House, Westminster, S.W.

CHERTSEY.—April 22nd.—For the erection of an additional engine-house, gas generating house, new work-shop and coal store adjoining the present pumping station, Byfleet Village, together with engine-sheds and other buildings, for the rural district council.—Mr. Charles Marchelon, Byfleet-corner, West Byfleet.

TETBURY.—April 23rd.—For sinking a borehole, for the urban district council.—Mr. H. J. Weaver, consulting engineer, Northgate Mansions, Gloucester.

GLASGOW.—April 29th.—For the wright and joiner's work in connection with the erection of a sanatorium and children's home, for the corporation.—Office of Works, 64 Cochrane-street, Glasgow.

Roads.

WATH-UPON-DEARNE.—March 29th.—For the supply of macadam, tar-macadam, kerbs, flags, and setts, for the urban district council.—Mr. J. H. Drew, engineer and surveyor.

DROXFORD.—March 29th.—For the supply of 1,250 tons of granite or hard stone, for the rural district council.—Mr. J. King, surveyor, Droxford, Hants.

BRIDGE.—March 29th.—For the supply of surface-picked and other hard flints and gravel, for the rural district council.—Mr. S. Sladden, highway surveyor, Littlebourne, Canterbury.

SKIPTON.—March 29th.—For the supply of lime-stone, granite, York setts, kerb and team labour, for the urban district council.—Mr. A. E. W. Aldridge, surveyor.

ST. PANCRAS.—March 29th.—For the removal of road sweepings and gully soil and horsing water vans, for the borough council.—Mr. W. Nisbet Blair, borough engineer and surveyor.

FRAMLINGHAM.—March 30th.—For the supply of broken granite and iron slag, for the urban district council.—Mr. Harry F. Rodwell, surveyor, Town Hall, Framlingham.

ROMFORD.—March 29th.—For the supply of 20,000 gallons of distilled tar, granite, and granite chippings, for the urban district council.—The Surveyor.

HARROGATE.—March 29th.—For the execution of private street works, for the corporation.—Mr. C. E. Rivers, borough engineer.

WEST ASHFORD.—March 29th.—For the supply of gravel, flints and Kentish rag-stone, for the rural district council.—Mr. A. Sims, surveyor, 3 Queen-street, Ashford.

CARDIGANSHIRE.—March 30th.—For strengthening and surfacing the Cardigan to Cenarth road with Welsh granite and tar-spraying, for the county council.—Mr. D. Davies, county surveyor, County Surveyor's Office, Brynhyfryd, Felinfach S.O.

GATESHEAD.—March 30th.—For cement path work in position, for the corporation.—Mr. N. P. Pattinson, borough engineer.

HADLEIGH.—March 30th.—For the supply of granite, for the urban district council.—Mr. H. W. F. Grimwade, clerk.

MID-LOTHIAN.—March 30th.—For conveying road materials, for the county council.—Road Offices, County Buildings, Edinburgh.

WARE.—March 30th.—For the supply of a new steam roller, for the urban district council.—Mr. G. H. Gisby, clerk, Town Hall.

TOTTENHAM.—March 30th.—For wood paving on a concrete foundation, for the urban district council.—Mr. W. H. Prescott, engineer.

CHESTER-LE-STREET.—March 30th.—For the supply of whinstone, blasting furnace slag, tar-macadam and cartage, for the rural district council.—Mr. G. W. Ayton, highway surveyor, Union Offices, Chester-le-Street.

FARNHAM.—March 30th.—For steam rolling and scarifying, for the rural district council.—Mr. A. Laker, clerk.

LYDD.—March 31st.—For the supply of Kent rag-stone, tarred and not tarred, for the corporation.—Mr. T. Kebbell, borough surveyor.

WELLINGTON.—March 31st.—For the supply of broken stone and broken slag, for the rural district council.—Mr. R. B. Phillips, surveyor, Edgbaston House, Wellington, Salop.

ISLE OF WIGHT.—March 31st.—For widening a road, for the rural district council.—Mr. H. Eldridge Stratton, clerk, 30 Pyle-street, Newport, I.W.

RICHMOND.—March 31st.—For repaving with granite the roadway of Richmond Bridge and approaches, for the Richmond Bridge Commissioners.—Mr. E. Cruttwell, engineer, 2 Queen Anne's-gate, Westminster.

MALDON.—March 31st.—For the supply of broken granite, granite chippings and flints, also for steam rolling, for the corporation.—Mr. Thos. R. Swales, borough engineer and surveyor, Municipal Offices.

WITHNELL.—March 31st.—For the supply of broken granite, chippings and limestone, for the urban district council.—Mr. J. Taylor, clerk.

LEPTON.—April 1st.—For the supply of granite and dross, for the urban district council.—Mr. G. W. Smith, clerk, 23 John William-street, Huddersfield.

ANDOVER.—April 1st.—For the supply of hand-picked surface flints and broken granite, for the rural district council.—Mr. J. Wormold, district surveyor, South Cottage, Andover.

MAGOR AND ST. MELLONS.—April 1st.—For the supply of broken limestone and gravel, for the rural district council.—The Surveyor, Union Offices, Queen's Hill, Newport, I.W.

LIMEHURST.—April 1st.—For the supply of road materials, for the rural district council.—Mr. H. H. Turner, surveyor, Waterloo, near Ashton-under-Lyne.

LEPTON.—April 2nd.—For steam rolling and scarifying, for the urban district council.—Mr. G. W. Smith, clerk, 23 John William-street, Huddersfield.

KIRKBURTON.—April 2nd.—For steam rolling and scarifying, for the urban district council.—Mr. G. W. Smith, clerk.

KEIGHLEY.—April 3rd.—For laying tar-macadam on 700 sq. yds. of roads and footpaths, for the Joint Hospital Board.—Messrs. Moore & Crabtree, Town Hall-square, Keighley.

PATRINGTON.—April 3rd.—For the supply of road stone, for the rural district council.—Mr. W. H. Snaith, surveyor, Patrington, near Hull.

RAMSEY.—April 3rd.—For the supply of tarred slag, broken granite, and granite chips, for the urban district council.—Mr. R. F. Serjeant, clerk.

TENTERDEN.—April 5th.—For the supply of granite or other approved macadam, for the rural district council.—Mr. W. L. C. Turner, district surveyor, Tenterden.

BOLTON-UPON-DEARNE.—April 5th.—For carrying out street works, for the urban district council.—Mr. J. W. Wilson, surveyor.

FOOTS CRAY.—April 5th.—For the supply of road materials, for the urban district council.—Mr. W. A. Farnham, surveyor, Sidcup.

BENTLEY.—April 5th.—For the supply of tar-macadam, whinstone and dross, for the urban district council.—Mr. R. G. Whitley, surveyor.

BILLERICAY.—April 5th.—For the supply of granite, Kentish rag, Kentish flints, gravel, screenings, sand, cartage, and man and horse hire, for the rural district council.—Mr. F. E. Ennals, surveyor, Shelley-road, Hutton, Essex.

GLASGOW.—April 6th.—For paving several streets with compressed rock asphalt, for the corporation.—Office of Public Works, 64 Cochrane-street.

DUMBARTONSHIRE.—April 7th.—For the supply of whinstone, for the county council.—Mr. J. F. Robertson, 179 West George-street, Glasgow.

KINGSTON-UPON-THAMES.—April 7th.—For the supply of 1,700 tons of Guernsey, Quenast, or other granite, for the corporation.—Mr. R. Hampton Clucas, borough surveyor.

HUDDERSFIELD.—April 7th.—For the supply of 490,000 creosoted Baltic red wood blocks, size 9 in. by 3 in. by 5 in. deep, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

HORNSEY.—April 7th.—For making up a passage-way, for the town council.—Mr. E. J. Lovegrove, borough engineer and surveyor.

SWANSEA.—April 7th.—For the supply of [illegible] and 30,000 [illegible] for the corporation.—Borough Surveyor, [illegible], Swansea.

HOUGHTON-LE-SPRING.—April 8th.—For the supply of machine-broken blast-furnace slag, hand-broken whinstone, slag, and blue limestone riddlings, for the rural district council.—Mr. D. Balfour, 3 St. Nicholas' Buildings, Newcastle-on-Tyne.

ALTON.—April 8th.—For steam rolling and the supply of broken granite, for the rural district council.—Mr. C. W. Maudsley, surveyor, Park-close, Alton, Hants.

BULKINGTON.—April 10th.—For the supply of broken granite and haulage, for the urban district council.—Mr. C. Blakeway, clerk, 2 Church-street, Nuneaton.

MALDENS AND COOMBE.—April 13th.—For making up and maintaining South-lane (part of), measuring 886 ft.; for paving with artificial stone slabs the footways in South-lane; and for constructing 625 yds. of 18-in. and 15-in. concrete tube, and about 82 yds. of 9-in. stoneware pipe surface-water sewer, together with manholes, for the urban district council.—Mr. R. H. Jeffes, engineer and surveyor.

Sanitary.

CRANBROOK.—March 29th.—For the construction of sewage disposal works, for the rural district council.—Mr. J. H. Bailey, sanitary surveyor.

HAMBLEDON.—March 29th.—For the collection and removal of refuse, for the rural district council.—Mr. F. Smallpeice, clerk, 138 High-street, Guildford.

SOUTHGATE.—March 30th.—For the supply of disinfectants, for the urban district council.—Mr. C. G. Lawson, surveyor.

TOTTINGTON.—March 31st.—For the removal of house refuse, for the urban district council.—Mr. L. Kenyon, surveyor.

MANSFIELD.—April 3rd.—For laying stoneware pipe sewers, for the corporation.—Mr. T. P. Collinge, borough engineer and surveyor.

STANLEY.—April 5th.—For cleansing ashpits and removing house refuse, for the urban district council.—Mr. J. G. Ridley, clerk.

CHURCH.—April 5th.—For work of sewerage, for the urban district council.—Mr. J. B. Fallowfield, surveyor, Church, Lancs.

PRESTWICH.—April 6th.—For the construction of a storm-water drain, tube sewers, and manholes, for the urban district council.—Mr. S. H. Morgan, engineer, Prestwich, Lancs.

RUISLIP-NORTHWOOD.—April 7th.—For certain supplementary works for sewage disposal at the purification works, consisting of sedimentation tank, bacteria beds, humus tank, pipe connections, sluice gates, valves, and other fitments, for the urban district council.—Mr. H. Howard Humphreys, consulting engineer, 28 Victoria-street, Westminster, S.W.

UXBRIDGE.—April 8th.—For the construction of a sewerage scheme, for the rural district council.—Mr. J. W. Harrison, engineer and surveyor.

SWANSEA.—April 8th.—For the construction of stoneware pipe sewers, and manholes, for the corporation.—[illegible].

DEWSBURY.—April 9th.—For the supply of disinfecting powder and disinfecting fluid, for the corporation.—Mr. B. Ellis, town clerk.

THURROCK.—April 19th.—For the construction of about 4 miles of stoneware and iron sewers of 9-in., 12-in. and 15-in. diameter, with manholes and other appurtenances, engine-house, screen chambers, suction tank, and about 1½ miles of 12-in. pumping main, for the Joint Sewerage Board.—Mr. G. Midgley Taylor, engineer, Caxton House, Westminster, S.W.

RAWMARSH.—For relaying part of the main sewers in the South Ward, comprising about 700 yds. of 18-in. pipes or tubes, and 700 yds. of 9-in. pipes, with manholes, flushing chambers, and ventilation shafts, for the urban district council.—Mr. J. A. Tonge, engineer, Parkgate, Yorks.

Stores.

GUILDFORD.—March 29th.—For the supply of tarmacadam, broken granite, best broken slag, chippings, [illegible] steam pipes, disinfectants, horse hire and cartage, iron castings, ironmongery, lubricating and other oils, pitch and tar, Portland cement and lias lime, stoneware pipes, saddlery and harness repairs, for the corporation.—Mr. E. Young Harrison, borough surveyor, Tuns Gate, Guildford.

SOUTHAMPTON.—April 7th.—For the supply of stores and material, including broken granite, for the corporation.—Borough Engineer.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted † Recommended for acceptance
‡ Provisionally accepted

[illegible] the following tenders have been accepted by the rural district council for municipal works or supplies.
[illegible] Surveyor
[illegible] Granite Company, Ludlow; [illegible], Shrewsbury.
[illegible] Penmaenmawr and Welsh Granite Company; Penmaenmawr. Pwllheli Granite [illegible]; Carrog Granite Company, Chirk, North Wales.
[illegible] Welton & Sons, Chesterfield. H. [illegible] & Co., Stockport.
[illegible] Hedges, R. Allen, Wrexham.
Cinders.—Salt Union, Limited, Winsford; G. Bozson, junr., [illegible].
[illegible] Needham & Sons, Stockport.
[illegible] Hensbarrow Road Asylum, [illegible].

CAISTOR.—Accepted for the supply of 7,100 tons of granite, [illegible] for the repair of [illegible] for the county.
Granite.—Ellis & Everard, Bardon Hill; M. Jackson & Son, Louth; Ord & Maddison, Darlington; Mountsorrel Company, Mountsorrel.
Slag.—[illegible] & Son, Kelsey.
Tar-macadam.—Atkinson & Son, Kelsey.

CONGLETON.—The following tenders have been accepted [illegible] H. Webster, borough surveyor:—
[illegible] Penmaenmawr and Welsh Granite Company, Limited; Ellis & Everard.
Slag.—[illegible] Company, Limited, Hackington; T. Mellor, Congleton.
Flag.—[illegible] Company, Limited, Hackington; T. Mellor, Congleton.
Kerbs.—T. Mellor, Congleton.
Channelling.—T. Mellor, Congleton.
Horse Provender—to September 30th next.—C. Caudwell.

EASTRY.—For the supply of flints and steam rolling, for the rural district council.—Mr. D. E. Foster, surveyor, Sandwich.
A. [illegible] Ham, 100 yds. at 7s. Woodnesborough, 340 yds. at 6s.
J. Bass, Mongeham.—Ham, 100 yds. at 7s. 6d.; Great Mongeham, 340 yds. at 6s.; Sholden, 140 yds. at 6s. 6d.
Mrs. Birch, Tilmanstone.—Northbourne, 600 yds. at 4s.
A. O. Megs, Ripple.—Ripple, 340 yds. at 6s. 6d.
Wingham Company, Wingham.—Staple, 600 yds. at 6s. 8d.; Ash (Section 2), 600 yds. at 7s. 6d.; Elmstone, 100 yds. at 7s. 5d.; Goodnestone, 800 yds. at 6s. 6d.; Preston, [illegible] Southmouth, 200 yds. at 7s. 6d.; [illegible] Ash (Section 1), 800 yds. at 7s. 6d.
R. Elvey, [illegible] Ash Section 1, 800 yds. at 7s. 6d.
Wingham Company, Wingham.—Steam rolling (Section 2), [illegible] yds.
H. E. Blunt, Sholden.—Steam rolling (Section 1), 5,100 yds. [illegible].

[illegible] earthenware [illegible] sewers, for the rural district council.—Mr. J. R. Lupton, surveyor:—
E. Dyson, Pelton, Co. Durham, £149.

Middleton.—For [illegible] and draining [illegible] for the corporation.—A. Welburn, borough [illegible].
W. Bailey & Co., Limited, Manchester £482
R. Heard, Middleton Junction . . 430
R. Partington & Son, [illegible]eton 421
R. Taylor, Middleton* 373

MIDDLETON.—For surfacing a carriageway, for the corporation.—Mr. W. Welburn, borough surveyor:—
R. Partington & Son, [illegible]eton £912
W. H. Worthington & Sons, Manchester 769
W. Shepherd & Son, Rochdale* 768

OXENDON.—For the supply of road materials, for the rural district council.—Mr. W. J. Smith, surveyor, Market Harborough:—
2½-in. Best Granite, at Harborough Station.—Cliffe Hill Granite Company, Markfield, 9s. 2d. per ton; Groby Granite Company, Groby, 8s. 10d. per ton; Whitwick Granite Company, Whitwick, 8s. 11d. per ton; Enderby Granite Company, Enderby, 8s. 10d. per ton.
2½-in. Seconds Granite, at Harborough Station.—Cliffe Hill & Everard, Bardon Hill, 7s. 9d. per ton.
At Welford Wharf.—Mountsorrel Granite Company, 8s. 11d. per ton.
Best Slag, at Harborough Station.—Smart & Sons, Cransley Furnaces, 5s. 3d. per ton.
(Other stations in proportion.)

RAWTENSTALL.—Accepted for making up [illegible] streets, for the corporation.—Mr. J. Johnson, borough surveyor:—
E. Hanson, Rawtenstall.

RICHMOND (Surrey).—The following tenders have been accepted by the corporation:—
Baxter & Wray, Richmond.—Portland cement and grey Lime.
F. Brown & Co., Richmond.—Thames Ballast.
J. Bates, Richmond.—Gravel and pit ballast.
Pontifex & Co., London.—Ironfounders' work.
Patent Victoria Stone Company, Limited; Adamant Stone and Paving Company, Limited.—Artificial stone slab paving.
Rowe & Mitchell.—Granite delivered at Brentford.
Enderby and Stoney Stanton Granite Company.—Granite delivered at Kew Bridge railway station.
Smeed, Dean & Co.—Chalk flints and brown flints.
Wettern Brothers, Limited.—Granite kerb, channel setts, and quadrants.
J. Farrer & Sons, Limited.—York paving.
Brooks, Limited.—Non-slip stone.
Gas Light and Coke Company, Limited.—Dehydrated tar.
Tarmac, Limited.—Tarred macadam.
Two tenders were received for cartage—viz., from J. Bates and Stevens Brothers, who each quoted at the same rates, and the council agreed to accept both tenders.

THAKEHAM.—For the supply of broken basalt or granite and unbroken flints, for the rural district council.—Mr. W. Forrester, surveyor:—
Groby Granite Company, Leicester.—Granite, 14s. 5d. and 14s. 6d. per ton; chippings, 10s. 11d. and 11s. per ton.
Croft Granite Company, Croft.—Jersey granite, 13s. 8d. per ton.

UPPINGHAM.—For the supply of granite and screenings, for the rural district council.—Mr. T. Northen, surveyor:—
Granite.—Ellis & Everard, Bardon Hill, 2,000 tons; Cliffe Hill Granite Company, Markfield, 2,000 tons.
Slag.—Prestwich & Sons, Dronfield, as required; Holwell Iron Company, Asfordby, as required.

WARE.—Accepted for the supply of tar-macadam and granite, for the urban district council.—Mr. G. H. Gisby, clerk:—
Tarmac, Limited, Wolverhampton.—16s. 2d. per ton for 2½-in., 1½-in., and ⅝-in. ironstone slag tar-macadam.
W. Griffiths & Co., Limited, London, E.C.—12s. 8d. per ton for 1½-in. Grieff granite; 13s. 2d. per ton for 1½-in. ditto; 14s. 2d. per ton for 2-in. ditto; 11s. 5d. per ton for ¼-in. to dust ditto.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MARCH.

26.—Institution of Municipal and County Engineers: South-Eastern District Meeting. 92 Victoria-street, S.W., 6 p.m.
27.—Institution of Municipal and County Engineers: South Wales District Meeting at Cardiff.
27.—Institution of Municipal and County Engineers: South-Western District Meeting at Taunton.

APRIL.

10.—Institution of Municipal and County Engineers: East Midland District Meeting at Loughborough.
13.—Society of Engineers: Mr. Frank Grove, assistant county surveyor of Surrey, on "Main Roads, Past and Present, and Modern Methods of Construction and Maintenance." Institution of Electrical Engineers. 7.30 p.m.

MAY.

28.—Royal Sanitary Institute: Meeting at Shrewsbury. Discussion on "The Value of Mechanical Filters in the Purification of Water." 7.30 p.m.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BOROUGH OF TORQUAY.

The Torquay Town Council is prepared to receive applications for the appointment of "Building Inspector and Clerk of Works for New Buildings by Administration," at a salary of £130 per annum.

Candidates must be thoroughly qualified persons, and have had experience in the administration of Building By-laws, and will be required to undertake the inspection and testing the drainage of all new Buildings, and keep all records in connection therewith. Candidates must have had good practical experience in all branches of the Building Trade, and the person appointed will be required to devote his whole time to the duties.

Applications, in candidate's own handwriting, stating age, experience, past and present employment, accompanied by copies of not more than three testimonials, and endorsed "Building Inspector," to be sent to the undersigned not later than Tuesday, March 30th.

Canvassing, directly or indirectly, will be considered a disqualification.

HENRY A. GARRETT, A.M.I.C.E., &c.,
Borough Engineer and Surveyor,
Torquay.

Town Hall, Torquay.
March 15, 1915. (2,475)

UNIVERSITY OF LIVERPOOL.

FACULTY OF ARTS.

CHAIR OF CIVIC DESIGN.

The Council invite applications for this Chair, which is associated with the School of Architecture. Salary £400. Residence required from 1 October to 31 March. Professional practice allowed on conditions. Duties to begin 1 October, 1915. Applications, together with the names of three persons to whom reference may be made, and twelve copies of not more than six testimonials, should be forwarded to the undersigned on or before 10 May, 1915. Further particulars regarding conditions and duties may be had on application.

EDWARD CAREY,
(2,472) Registrar.

WANTAGE RURAL DISTRICT COUNCIL.

TEMPORARY ENGINEERING ASSISTANT FOR WATER SUPPLY, SEWERAGE AND SEWAGE DISPOSAL SCHEMES.

Applications are invited for the appointment of a Temporary Assistant in the Engineer's and Surveyor's Office, for a period of about 12 months at a salary of two and a-half guineas per week, subject to one month's notice on either side.

Applicants must be good draughtsmen, accurate surveyors and levellers, and proficient in the preparation of Specifications, Bills of Quantities, and Estimates.

Applications, stating age and experience, accompanied by copies of three recent testimonials, to be sent to the undersigned not later than Tuesday, the 6th day of April, 1915.

JOHN W. HARRIS.
Engineer and Surveyor.

East Challow,
Wantage, Berks.
March 20, 1915. (2,496)

SHEFFIELD CORPORATION WATER DEPARTMENT.

EWDEN VALLEY RESERVOIR WORKS.

COST CLERK.

Cost-Accountant, thoroughly qualified, with practical experience in Engineering and Contractors' costing, preferably on public works.

Apply, stating age, experience, and salary required, with copies of three recent testimonials—

GENERAL MANAGER.

Water Department,
Town Hall, Sheffield. (2,504)

COUNTY BOROUGH OF HUDDERSFIELD.

The Corporation require the services of an experienced District Superintendent of Highways to take charge of a District under the Borough Engineer.

Applicants must have had practical experience in sewering, paving and macadamising of roads, and be competent to set out and measure up work, and keep daily accounts of all labour and materials used.

The person appointed must have had previous practical experience in a similar situation, and be prepared to reside within his District.

For statement of duties apply to the Borough Engineer.

Salary, £130 per annum.

Applications, in the handwriting of candidates, giving full particulars of present and previous occupation, age, &c., accompanied by copies of not more than three testimonials of recent date, endorsed "District Superintendent of Highways," must reach me not later than 10 a.m. on Thursday, the 8th April, 1915.

Canvassing will disqualify.

K. F. CAMPBELL, M.INST.C.E.,
Borough Engineer and Surveyor.

1 Peel-street,
Huddersfield.
March 23, 1915. (2,503)

ASSISTANT to Surveyor and Inspector of Nuisances, Kingswood Urban District Council. 25s. per week. Stenographer and typewriter preferred. No canvassing. Applications endorsed "Assistantship"), with two testimonials, by 6th April, to the Clerk, Council Offices, Kingswood, Bristol. (2,501)

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Royal Commission on Sewage Disposal: Final Report.

The long expected Final Report of the Royal Commission on Sewage Disposal has now been published. It gives the results of an inquiry which has extended over a period of sixteen years, and although it consists almost entirely of a recapitulation of the conclusions already published in the preceding nine reports, these have been so well summarised that we feel we cannot do better than reproduce the major portion for the benefit of our readers in the form of the copious extract which are printed on another page. The Ninth Report issued simultaneously with the Final Report, deals with the discharge of manufacturing wastes which for any reason could not be taken into sewers, and with the disposal of these to rivers in rural areas, and will be discussed in detail in the place on another occasion. The other eight reports were reviewed in these columns from time to time as they appeared, and it now remains to sum up the total result of the long extended labours of the commission. It must be confessed that we were somewhat disappointed to find in this Final Report merely a bare recapitulation of the conclusions of the earlier reports as we expected to see a careful review of the whole subject. Possibly the commissioners have taken the view as we did that the really effective results of the whole of their work, at any rate so far as the disposal of ordinary town's sewage is concerned, were embodied in the conclusions and recommendations contained in the Eighth Report. It is true that the conclusions in the Fifth Report, which dealt with the relative merits of the various methods available for the purification of the sewage of towns, have already been largely adopted by the Local Government Board and applied to the many schemes which they have had under consideration since that report was published, and in this way a great advance in the application of modern methods of treatment has been secured. The real effect of this was, however, simply to bring the official requirements up to date and in conformity with the knowledge and experience of the subject already possessed by engineers and others engaged in this branch of work. The Eighth Report, on the other hand, in its conclusions, suggested a distinct advance beyond anything that had previously been proposed by fixing a *general* standard for effluents, and making provisions for the fixing of *special* standards under certain conditions, varying with the amount of dilution afforded by the stream into which the sewage effluent is discharged. It is also important to note that, in determining these standards, the object in view was to devise a system whereby a local authority should not be required to incur any further expenditure on sewage disposal than would suffice to prevent the occurrence of actual nuisance.

If we ignore the chronological sequence of the nine reports and consider the whole of the work done, the results may be summed up very briefly as follows: In the first place, the old idea that land treatment was absolutely essential is dropped, and it is recognised that artificial processes can be made to produce effluents which will not putrefy or produce a nuisance in a stream. Then we have, in the Fifth Report, a very elaborate description of a number of different artificial processes, and a careful comparison of the efficiency of various combinations of the different methods of preliminary treatment and filtration. The cost of operating these various combinations of methods is dealt with in the same report, and also the question of sludge disposal and the treatment of storm water. Further, in the Eighth Report, standards are fixed for sewage effluents, and it is stated that the volume of river water, as compared with the effluent, should be the governing factor in selecting any of these standards. It is also recommended that the law should be altered so that a person discharging sewage matter into a stream shall not be deemed to have committed an offence under the Rivers Pollution Act, 1876, if the sewage matter is discharged in a form which satisfies the requirements of the prescribed standard. With regard to trade wastes, these are dealt with very fully in the Third and Ninth Reports. Recommendations are made that the law should be altered so as to make it the duty of the local authority to take trade wastes into the sewers where this is possible, and, for cases where it is not possible, standards are prescribed for a large number of different trade wastes. Finally, for the proper carrying out of the control and protection of all rivers, it is recommended that Rivers Boards should be formed for all watersheds in the country, and that a central authority should be set up as the supreme rivers authority, in control of the Rivers Boards, to deal with matters relating to rivers and their purification, and, if necessary, to take action where local authorities have failed to do so, as well as to settle differences between local authorities and manufacturers. All that now remains to be done is to place these recommendations upon the Statute Book, so that they may be put into actual operation. It was rumoured some time ago that a Bill on these lines had actually been drafted, but that the Government could not find time for its introduction. In what way this important matter will be affected by the present

national crisis is a subject for speculation. Social legislation of this kind, even if it is non-contentious, may have to be postponed indefinitely on account of the cost. On the other hand, the annual expenditure involved in this matter should be exceedingly small when compared with the sums spent annually on other matters, and the benefit to the country generally would be very great. If, therefore, this proposed legislation may be described as non contentious, as we think it well may be, the present Session would seem to be a suitable opportunity for the consideration of a Bill embodying the recommendations of the Royal Commission. Full discussion in a friendly manner on both sides of the House of Commons should produce a really satisfactory Act. If this opportunity is not seized, the amount of work in Parliament after the war will probably be so great that the question of rivers protection and sewage disposal will most likely be put on one side for many years.

The work done by the Royal Commission has, with one or two exceptions, been good. The attempt to prepare comparative estimates of the cost of construction of various types of disposal works was unsatisfactory and apt to be very misleading. There are so many variable factors, due to the diversity of conditions in different places that each separate scheme must be considered on its merits, and no general rule can be formulated. Then, again, in making recommendations for the capacities of filters with different grades of material, dealing with sewages of different strengths, and preceded by different types of preliminary treatment, the figures given as the number of gallons of sewage for which 1 cubic yard of filtering material should be provided are in some cases too low, in others too high. Further, it is not made clear that these should be the *maximum* number of gallons to be treated on 1 cubic yard of filter material. Persons not possessing the necessary experience to enable them to form a sound judgment in the matter are apt to take the figures given by the Royal Commission as applicable to all and every condition, regardless of other considerations, with the result that their works are failures for the lack of a proper margin of safety in the size of the filters. In this connection it appears to us that the Royal Commission have missed a good opportunity for making a really useful change in the method of calculating the dimensions of filters. Domestic sewage, in all cases, contains the wastes from a certain number of persons, and the amount of impurities due to these wastes must be fairly uniform per person. In some towns and villages the impurities from each person are contained in 10 gallons of sewage, while in others they may be contained in anything up to 30, or even 40, gallons of sewage. All calculations are now based upon the daily dry-weather volume of sewage, and some attempt is made to provide for the variation of strength by giving separate figures for weak, medium, and strong sewages. The inexperienced person, anxious to give a preliminary estimate for a scheme at the lowest possible figure, and filled with confidence in the wisdom of the Royal Commission, takes the figure applicable to his particular system of treatment, which gives the least number of cubic yards for his filters, and quotes the result as being in accordance with the Local Government Board's *requirements!* This is one of the unsatisfactory effects of the publication of definite figures for the size of filters, and we think it might have been avoided to a large extent if the Royal Commission had taken the bold course of dropping the old method of calculating in "gallons per cubic yard" and substituting "cubic yards of filtering material per person (or per 1,000 persons) connected to the sewers." In conclusion, we may say that the work done by the Royal Commission in the sanitary survey of a number of rivers, as recorded in the Appendix to the Eighth Report, and which formed the basis upon which the Eighth Report was prepared, was excellent and worthy of every commendation. The information contained in the Appendix will be very useful in the future, and the recommendations made in the Eighth Report are very safe so long as care is taken to see that they are properly followed. So far as we are aware, these recommendations have not yet been adopted by the Local Government Board, but schemes will doubtless be presented to them on these lines in due course, and we hope they will not be rejected solely because the recommendations have not yet been legally enacted, but that they will receive consideration on their merits.

* * *

Extraordinary Traffic.

The paper on "Extraordinary Traffic" which was read at the Cardiff meeting of the Institution of Municipal and County Engineers by Mr. D. M. Jenkins, the borough surveyor of Neath, may best be described as a very able account of a difficult subject based upon the author's practical experience. The history of the law as to extraordinary traffic is not without interest. Prior to 1878 there was no procedure by which extraordinary expenses could be recovered in a civil action, the only remedy known to the law in case of damage to a highway being by indictment for a public nuisance. In that year, however, was passed the Highways and Locomotives (Amendment) Act, by sec. 23 of which the burden of extraordinary expenses incurred by a highway authority in the repair of a road was placed upon the shoulders of the person responsible for the traffic by which the damage was caused. This section, as amended by sec. 12 of the Locomotives Act, 1898, is still the foundation of the right of a highway authority to recover such expenses. In considering these enactments it should be borne in mind that the object of the Legislature in passing them was not to *prevent* extraordinary traffic, but merely to throw on the person who causes such traffic the liability to pay for the damage it does the road. In dealing with the question of what constitutes extraordinary traffic, Mr. Jenkins laid down four principles, three of which may fairly be extracted from the judgments delivered by the Court of Appeal in *Hill v. Thomas* (1893, 2 Q.B. 340), in which the earlier decisions were reviewed. It was there held that "extraordinary traffic" includes all such continuous or repeated user of the road by a person's vehicles as is out of the common order of traffic, and as may be calculated to damage the highway and increase the expenditure on its repair. "Extraordinary traffic" is really a carriage of articles over the road, at either one or more times, which is so exceptional in the quality or quantity of articles carried, or in the mode or time of user of the road, as substantially to alter and increase the burden imposed by ordinary traffic on the road, and to cause damage and expense thereby beyond what is common. Traffic is not extraordinary, however, merely because one man uses a road more than others do, even if it be his own user which has produced the mischief to the road. The traffic must be extraordinary as regards the ordinary user of the road as a whole by all who use it, and not merely large as regards the traffic put on the road by other persons.

The other principle laid down by Mr. Jenkins was that traffic may be extraordinary merely by reason of the mode in which it is conducted. In considering what parties should be made defendants in an action to recover extraordinary expenses, the provisions of sec. 12 of the Act of 1898 are important. It is therein enacted that the expenses are recoverable from "any person" by

of in consequence of whose order the weight of traffic has been ordered. The amendment of the law by substituting the words "by or in consequence of whose order" for the expression "by whose order" as used in sec. 23 of the Highways and Locomotives (Amendment) Act, 1878, is based upon the decision of the House of Lords in *Kent County Council v. Lord Gerrard* 1897, A.C., 633. It was held in that case that where Lord Gerrard requested by the delivery to him of materials by a contractor to be paid for by the district council, and the materials were conveyed along a certain highway, Lord Gerrard, knowing that it was intended to convey them by traction engines and trucks (although he did not pay the carriers or give specific orders as to the route or mode of carriage), he was not a "person in whose order such weight of traffic had been conducted." The object of the Legislature in altering the Act of 1878 was to bring a case like *Kent County Council v. Lord Gerrard, supra*, within its scope. The most recent finding appears to be to throw the liability upon the contractor, as being ultimately the person in whose consequence or whose order the damage is done.

In regard to the present recommendations made by Mr. Baines we would call emphasis to the fact that the obligation of the highway authority to maintain a road is not suspended during a period of extraordinary traffic, however much the road may be injured or affected. The authority must make all reasonable efforts to keep it safe and useful for the traffic both ordinary and extraordinary. Further, the authority should do its best to mitigate the ultimate damage by carrying out all such repairs whether permanent or temporary and neglect in this connection may expose the authority to the risk of a finding that the damage of which the complainant is attributable, wholly or in part, to their own default. And, second, the general practice which has been evolved from the various decisions of the Courts is to take the average cost of the five years preceding of maintaining the particular road concerned, and of similar roads in the neighbourhood, and to deduct this from the actual cost incurred on the former during and immediately after completing of the extraordinary traffic. Finally on the question of procedure, Mr. Baines gave some very useful hints for the surveyor's certificate, which is the first step in the legal formalities in connection with a claim, and for the conduct of the local authority authorising proceedings.

* * *

Exeter City Council and the Lowest Tender.

The problem of the lowest tender, like a very much larger issue in economics is always with us. It was discussed recently at the Exeter City Council in connection with the contract for making up certain roads, and it came out of the ordeal with flying colours it came, in fact, into its own, a position that had been denied to it by the Streets Committee, who, for reasons that seemed to be quite convincing to themselves, recommended the acceptance of a higher tender. The arguments *pro* and *con* in this instance put on the familiar lines, except that the Streets Committee sought to justify their action by the definite contention that they had "resolved to get a road builder" to do the work. It was a special sort of work, the chairman of the Streets Committee explained, the material to be used being pitch graphite. The firm whose tender they favoured were road builders, whereas that which had sent in the lowest tender were house builders, moreover, there was only a difference of £30 in the prices. The suggestion thrown out involving the question of competence was met by the assertion of a councillor that if the Streets Committee wanted only road makers to tender they should have said so in the advertisement. It might be contended in reply to this that the committee doubtless followed the customary practice of making the appeal to tenderers a wide one, and that, moreover, they gave their decision according to their view of the merits and capabilities of the various firms in what they regarded as special circumstances. The duty imposed upon them could not properly be enlarged to mean that if they did not exercise this privilege to the full. It would be equally ridiculous to suppose that they ought invariably to vote for the lowest tender. The matter is really more in practice as a question of the framing of the advertisement, which is frequently alleged to be drafted so as to favour the lowest tender.

* * *

Underpayment.

Having regard to the extraordinary conditions attached to the recently vacant appointment of surveyor to the St. Germans (Cornwall) Rural District Council, to which attention has already been directed in these columns, it is hardly surprising to find that the matter was discussed at the meeting held at Taunton last Saturday by the members of the South-Western District of the Institution of Municipal and County Engineers. The matter was introduced by Mr. C. O. Baines, of Paignton, who observed that for a number of years the conditions of appointments of this class have become more and more ridiculously restrictive and onerous in character, the salaries, however, appearing to vary in inverse ratio to the duties demanded. Mr. Baines desired to urge that the full power of the influence of the institution should be brought to bear to secure, if possible, some mitigation of the evil of over-restricted and under-paid appointments. A resolution designed to carry this desire into effect was not carried, presumably on the ground that the council of the institution are virtually powerless in the matter. The discussion, however, was none the less valuable, inasmuch as, in our view, the best weapon to use in the contest against these abuses is that of publicity. Moreover, we believe that a record of such cases is being kept at headquarters with a view to future use, but if we are wrong, we would suggest that this should be undertaken without delay.

* * *

Borrowing and the War.

In another column will be found a circular letter addressed last week by the Local Government Board to local authorities in England and Wales, dealing with the subject of borrowing for municipal works during the period of national crisis. In this circular the board state that they have come to an arrangement with the Treasury by which in most cases the board's sanction to a loan will be sufficient without any further Treasury approval. This arrangement applies to any sanction given since March 12th last, provided that the money is to be raised otherwise than by the issue of stock, bonds or bills, and its convenience to local authorities is manifest. It should be carefully observed, however, that where a local authority hold a sanction, approval or consent of the board of an earlier date than the 12th instant which has not yet been acted upon, whether wholly or in part, no further action must be taken upon it without a further sanction from the board authorising the action, unless the money is to be raised by the issue of stock, bonds or bill when the consent of the Treasury must be obtained instead of the further sanction of the board. The Treasury have further decided that their approval will not henceforth be required for the renewal or replacement by local authorities of maturing mortgages.

Extraordinary Traffic.*

By D. M. JENKINS, Assoc.M.Inst.C.E., Borough Surveyor, Neath.

This short paper on a much-debated subject is submitted in the hope that it will lead to a profitable discussion. It may be said at the outset that, owing to the great and general increase in recent years of mechanical traction on roads, the standard of maintenance by road authorities has necessarily been considerably raised, and that traffic which under the earlier conditions was rightly considered abnormal has now become more or less normal. This is, no doubt, true in regard to main and arterial roads along which heavy mechanically propelled traffic has become quite ordinary and general; but there still remain, and will continue to remain, classes of highways upon which the ordinary traffic is comparatively light, but which are from time to time liable to be subjected to heavy and dense traffic for special purposes. Claims in respect of extraordinary traffic, therefore, will continue to arise and call for the attention and consideration of road engineers.

The subject is briefly introduced under the following heads: (1) The enactments relating to extraordinary traffic; (2) what constitutes extraordinary traffic; (3) from whom expenses are recoverable; (4) the amount recoverable; (5) procedure.

(1) Enactments.

Mention may be made in passing of the excellent text-book on the subject by Barnard Lailey, of which the author has made free use, and which he found most helpful in working up a claim in which he was recently concerned.

Down to the year 1878 the only legal remedies available in respect of extraordinary traffic were those at Common Law; but, "short of causing a public nuisance, a highway might with impunity be subjected to excessive and wholly abnormal wear, caused in the course of an undertaking carried on for private gain, and by a person not even a ratepayer. The introduction of heavy locomotives for purposes of road traction accentuated this evil, and a change in the law was effected by the Highways and Locomotives (Amendment) Act, 1878, which provides:—

"Where, by a certificate of their surveyor, it appears to the authority which is liable or has undertaken to repair any highway, whether a main road or not, that, having regard to the average expense of repairing highways in the neighbourhood, extraordinary expenses have been incurred by such authority in repairing such highway by reason of the damage caused by excessive weight passing along the same, or extraordinary traffic thereon, such authority may recover in a summary manner from any person by whose order such weight or traffic has been conducted, the amount of such expenses as may be proved to the satisfaction of the Court having cognisance of the case to have been incurred by such authority by reason of the damage arising from such weight or traffic as aforesaid.

"Provided that any person against whom expenses are or may be recoverable under this section may enter into an agreement with such authority as is mentioned in this section for the payment to them of a composition in respect of such weight or traffic, and thereupon the person so paying the same shall not be subject to any proceedings under this section."

The only subsequent enactment on the subject is contained in sec. 12 of the Locomotives Act, 1898:—

"(1) Sec. 23 of the Highways and Locomotives (Amendment) Act, 1878 (which relates to the recovery of expenses of extraordinary traffic), shall be amended as follows: —

"(*a*) Expenses under that section shall cease to be recoverable in a summary manner, but may be recovered, if not exceeding £250, in the County Court, and if exceeding that sum in the High Court.

"(*b*) Proceedings for the recovery of any expenses incurred after the passing of this Act shall be commenced within twelve months of the time at which the damage has been done, or where the damage is the consequence of any particular building contract or work extending over a long period, shall be commenced not later than six months after the completion of the contract or work.

"(*c*) There shall be substituted for the words 'by whose order' the words 'by or in consequence of whose order.'

"(2) Nothing in this section shall affect the prosecution and determination of any proceedings which have been commenced before this Act shall come into operation."

(2) What constitutes extraordinary traffic.

The section quoted from the Act of 1878 refers to "damage caused by excessive weights" or "extraordinary traffic," and the author has for brevity used the latter term as inclusive of the former. As the result of a number of decisions of the Courts, which, in the earlier stages, varied considerably from one another, the following principles have been established: —

(1) "The question of whether weight is 'excessive' or traffic 'extraordinary' is to be determined by reference to the ordinary traffic on the particular road and to the character of that road.

(2) "The plaintiffs must show a user of the road by defendant which was out of the common order of traffic, and which substantially increased the burden imposed by the ordinary traffic.

(3) "Traffic may be 'extraordinary' by reason of the mode in which it is conducted (see, *e.g.*, *Mayor of Wolverhampton* v. *Salop County Council*).

(4) "It is not an answer to a claim that the traffic is of a kind common in the district, or that it would be ordinary traffic on neighbouring roads."

These principles may be best elucidated by a concrete example, and a few particulars are given of a case with which the author was concerned in his own district, but which, however, did not go to the Courts, but was settled after the issue of the writ. The road in question had a length of 5 furlongs. The ordinary traffic on it was light, consisting in the main of horse-drawn vehicles—such as farmers' and tradesmen's carts and private carriages. The extraordinary traffic consisted of the conveyance of large quantities of building and engineering materials used for the construction of a water service reservoir outside the borough for the Neath Rural District Council. The vehicles used for the purpose were heavy wagons carrying a load of 5 tons, drawn by steam traction engines.

The road had no artificial foundation, and had simply a surface coat of limestone metalling, steam rolled; but it carried the ordinary light traffic satisfactorily, and there was abundant evidence that under normal conditions it was adequately constructed and maintained.

Under the extraordinary traffic the surface was broken through, deep ruts were formed, the underlying subsoil (chiefly clay) was "spewed" up, and generally the road was completely disintegrated throughout its whole length.

It was argued on the other side that the road was used by other motor vehicles, but the fact was that this user was only occasional, and that the traffic which caused the damage was constant over a long period. The point underlying this is that with merely occasional heavy traffic the road has time to recover itself in between, whereas the continuous heavy traffic produced a constantly accumulating effect.

It was also urged that traffic of the kind which caused the damage was common in the district; but this contention, in view of the conditions which have hitherto obtained, was irrelevant. The question was whether the traffic on this particular road was extraordinary or not. If in the future heavy motor traffic on the road in connection with some established industry becomes general, then it will probably be the duty of the road authority to reconstruct and maintain it in a manner to properly withstand such traffic.

It may be mentioned that the legal meaning of extraordinary traffic as now established appears to coincide with the official view expressed in a circular issued by the Local Government Board in 1878, that the Act of that year would "prove serviceable in enabling highway authorities to recoup the heavy expenditure not infrequently occasioned by extraordinary and exceptionally heavy traffic arising from

* Paper read at the South Wales District meeting of the Institution of Municipal and County Engineers held at Cardiff last Saturday.

building and similar operations of a temporary character, and from other causes by which the road accommodation provided for all alike at the public expense is sometimes abused by individuals for private purposes."

(3) FROM WHOM EXPENSES ARE RECOVERABLE.

It will be recalled that under the Act of 1878 the obligation is imposed upon "any person by whose order" the traffic in question has been conducted.

In the common case of a large building erected by a builder in whose vehicles and by whose servants the materials for the building are conveyed along a highway, the earlier litigation on the subject appears to have decided that the builder is liable to the highway authority, notwithstanding that he is not building on his own account, but in performance of a contract with some other person.

For obvious reasons it became a frequent aim to make the employers of the builders liable, and, further, there arose claims in which the circumstances were such as to render it difficult, or even impossible, to establish a case against the person directly conducting the traffic.

In certain cases where sub-contractors were engaged by contractors and left free to select their own mode of haulage and chose to use traction engines, the sub-contractors were held liable; but where sub-contractors were employed to specifically convey materials by traction engines, the contractors or other employers were held liable. (The point about the use of traction engines is, of course, that much heavier loads are carried than in ordinary horse-drawn vehicles.) In the well-known case of *Kent County Council* v. *Lord Gerrard*, defendant carried on extensive building operations, and employed different persons to do the haulage of materials, leaving them free to choose their own means of conveyance, but knowing at the same time that haulage by traction engines was the only mode practicable. It was held that defendant was not the person "by whose order" traffic had been conducted, and it was further pointed out that the words of the Act were "by whose order" and not "in consequence of whose order."

As a result of this case the Amending Act of 1898 was passed. This substituted for the words "by whose order" the words "by or in consequence of whose order." The effect of the amendment is that either the person by whose order or the person in consequence of whose order traffic is conducted, or both, can be sued.

For some years after the legal view was that, unless the route or the mode of traffic was such as could not be foreseen, the Amending Act imposed the liability upon the employer. But a case arose in which a brick company were employed to deliver large quantities of bricks for building a house, with no directions as to the mode of delivery, and it was held that damage to roads was done in consequence of the order of the vendors of the bricks. The effect, however, of subsequent decisions is that a person entering into a contract as employer can only escape liability by showing that the route or method adopted was not a usual or natural one, and not within his contemplation when he entered into the contract. The most recent tendency appears to be to throw the liability upon the employer, as being ultimately the person by or in consequence of whose order the damage is done. This appears to be the equitable view, and for the following reasons: The cost of making good any incidental damage is really part of the cost of the building or other works for which materials are conveyed. The employer may specifically include the making good of damage to roads in the contract for the works, and therefore pay for it through the contractor. But in any case it seems that the liability to the highway authority should rest upon the employer, leaving it to him to enforce his remedy, if any, against his contractor.

It has become the general practice to provide in contracts for large buildings or other works that contractors are to be liable for claims in respect of extraordinary traffic, and, as bearing on this point, it may be mentioned that in the Reigate case, the highway authority having recovered from a water company extraordinary expenses arising from damage caused by the cartage of materials for the construction of a reservoir, the company recovered over, under a clause in the contract, against their contractor, who was brought in as a third party.

It is now generally recognised that the safe and most desirable course is to make both the employer and contractor defendants. It is always easy to drop a defendant upon [illegible] costs thrown away, in the event of its being found, upon discovery, that a claim cannot be maintained against a particular defendant, are not likely to be heavy," and quite worth the risk of not spreading the net wide enough. Cases may arise in which sub-contractors should also be brought in as parties—as, for example, when exceptionally heavy loads are carried or the traffic is confined to the same wheel-tracks instead of being distributed over the whole width of road; in such cases it is conceivable that the Court may apportion part of the expenses against the sub-contractor; but, of course, much must depend upon the terms of the sub-contract.

In the Neath case before-mentioned the rural district council entered into a contract for the construction of a service reservoir and incidental works, which included the supply and delivery of all materials. No specific mode of haulage was stipulated, and there was only one practicable route available for the traffic. The contractor engaged to convey the materials a local sub-contractor, who carries on a large haulage [illegible] only. The contract between the rural council and the contractor placed the whole liability for making good damage to the roads upon the contractor; but, so far as could be ascertained, there was no explicit arrangement on the subject as between the contractor and sub-contractor. In these circumstances it was considered that the cost of making good damage arising from extraordinary traffic having been provided for in the contract, and that haulage by heavy traction engines having been arranged for by the contractor as no doubt being the cheapest and most expeditious method, the contractor was equitably liable for the extraordinary expenses. Having regard, however, to the tendency in recent cases to fix the ultimate responsibility upon the employer, it was decided to join the rural council and the contractor as parties to the action. Further, the individual loads carried and their distribution on the road surface (and therefore the extent of the damage) being matters which depended upon the sub-contractor, it was thought advisable to make him also a party. Proceedings were therefore instituted against the council, the contractor and the sub-contractor.

(4) THE [illegible]

It must be clearly understood in the first place that the obligation of the highway authority to maintain a road is not suspended during a period of extraordinary traffic, however much the road may be injured or affected. The authority must make all reasonable efforts to keep it going, and enable it to carry the traffic, both ordinary and extraordinary. Further, the authority should do its best to mitigate the ultimate damage by carrying out all such repairs, whether permanent or temporary, and neglect in this connection may expose the authority to the risk of a finding that the damage of which they complain is attributable, wholly or in part, to their own default.

Upon completion of the extraordinary traffic it devolves upon the highway authority to thoroughly repair the damage or reinstate the road. The whole cost incurred is then to be made up, and the extraordinary expenses arrived at. It will be recalled that the statute refers to extraordinary expenses having regard to the average expense of repairing not the particular road in question, but highways in the neighbourhood. The main object of this provision appears to be to eliminate the effects of inequalities in the ordinary traffic, and to ensure a broad survey of the situation being taken. The "highways in the neighbourhood" selected for comparison should obviously, be as nearly as possible similar to and subject to like conditions of traffic with that under consideration. This is not altogether an easy matter to determine, but it is no doubt practicable in most cases to make a reasonable selection, especially where a periodical census of traffic is taken.

The general practice which has been evolved from the various decisions of the Courts is to take the average cost for the five years preceding of maintaining the particular road concerned, and of like roads in the neighbourhood, and to deduct this from the actual cost incurred on the former during and immediately after completion of the extraordinary traffic.

To take the concrete example already cited, the total actual expense, excluding establishment charges, incurred by the highway authority during the period of about a year, over which the extraordinary traffic extended, was £332. The average annual cost per mile of repairing this road and of four other high-

ways in the neighbourhood was taken at £100 per mile, or £62 for the actual length in question. The amount recoverable and claimed on this basis was £270. It may be remarked that the actual average cost of maintenance of the several roads, as extracted, was considerably less than £100 per mile—in fact, under £60—while that of the special road concerned was £58; but, in order to be on the safe side, it was decided to state the average annual cost at under £100 per mile. The fact that it has been laid down in one important decision (*Ledbury Rural District Council v Codwall Park Quarries Company*) that "regard should be had to the fact (if it is a fact) that the ordinary expenditure on repairs has been rising," indicates that it is advisable to provide a reasonable margin in making the deduction for average cost of repairs.

Two other principles appear to have been established in this connection:—

(*a*) That due allowance should be made for the weather if bad when the traffic was led. It is not easy to arrive with any precision at an exact amount, but the additional cost of repairs of other roads during an especially inclement season will generally give a working basis, and here again it is advisable to take care to make a sufficient allowance.

(*b*) That a deduction should be made for betterment, "being the value of the extent to which the structure or general condition of the road is improved as a result of the repairs rendered necessary by the extraordinary traffic." The fact that the road was "granited," or widened, or provided with a thicker crust may be taken into account in this connection. This, again, is a difficult principle to apply in practice, and it appears that only an approximate estimate can be arrived at. In *Kent County Council v. Kent Coal Concessions*, the Court, having arrived at the sum by which the expense incurred in consequence of damage caused by the defendants' extraordinary traffic exceeded the normal cost of repairs, made a deduction of one-third from such sum on the ground that the road had been given a new life, from which the plaintiffs would derive benefit.

In the more recent cases, however, the application of the principle of betterment has been narrowed down, and the mere fact that, as an incident to carrying out only essential repairs, a road has been improved and given a longer life, does not appear to justify a deduction for betterment. In the Neath case referred to very deep ruts had been formed in the road, and these were filled up with strong stone ballast before the surface (limestone) metalling was put on. This certainly improved the foundation of the road in parts, but the only alternative was to make up the whole surface with limestone metalling, which would have considerably increased the cost. Further, the thorough coating of the whole length of road at one time will no doubt have the effect of reducing the cost of ordinary maintenance for a few years; but the special repairs carried out having been limited to the reinstatement of the surface with the same kind of material (without generally improved construction or widening), a claim in respect of betterment, although it was put forward by the contractor, does not appear to have been tenable.

(5) Procedure

The legal formalities in connection with a claim in respect of extraordinary traffic commence with the issue of the surveyor's certificate; but before this stage is reached it is advisable to enter into communication with all the parties concerned with the traffic. As soon as definite damage to the road is observed, the persons directly or indirectly conducting the traffic should be notified that it is intended to carry out necessary repairs; and, finally, on completion of the traffic, they should be informed that it is intended to forthwith thoroughly reinstate the road. If this informal procedure is adopted, the parties have no ground subsequently to complain that they were given no opportunity of anticipating a claim or of checking the extent or the reasonableness of the repairs executed, and although there is no legal obligation to give the information indicated, there is no doubt that the course suggested is a fair and safe one, and that its adoption will carry due weight at the trial.

The Locomotives Act of 1898 enacts that "Proceedings for the recovery of any expenses . . . shall be commenced within twelve months of the time at which the damage has been done, or, where the damage is the consequence of any particular building, contract or work extending over a long period, shall be commenced not later than six months after the completion of the contract or work." The right given to commence proceedings within six months after the completion of a contract or work does not cut down the right given by the earlier parts of the section, and in these cases the action will be in time if commenced either within six months of the completion of the contract work or within twelve months of the time at which the damage was done. With regard to the completion of a contract, it has been held that this means "constructional completion" and not "contractual completion," which latter may run to the expiration of the maintenance period. It is also to be noted that the action will not lie until the expense claimed has been already incurred.

In the particular case mentioned various repairs were carried out from time to time as the extraordinary traffic proceeded, entries being duly made of all the items of labour and materials employed. As soon as possible after termination of the contract, the final reinstatement was proceeded with, and on completion the total expense incurred was made up. At the next meeting of the council the certificate of the surveyor was submitted, as follow:

"In the matter of 'The Highways and Locomotives (Amendment) Act, 1878,' and 'The Locomotive Act, 1898.'

To The Neath Urban District Council.

I, the undersigned David Morgan Jenkins, surveyor to the above-named highway authority, hereby report and certify that, having regard to the average expense of repairing highways in the neighbourhood, extraordinary expenses have been incurred by the said authority during the current financial year ending on the 8th day of November, 1913, in repairing the highway known as Upper Cimla-road, in the borough of Neath, having a total length of 5 furlongs, or thereabouts, by reason of the damage caused by excessive weights passing along the same and extraordinary traffic thereon—namely:—

The conveyance along the said highway of large quantities of building and engineering materials used in connection with and for the purpose of a new water service reservoir or storage tank, and other incidental works carried out by the Neath Rural District Council.

The contractor employed to carry out the said works for the said rural district council was ..... of .....

The haulage of the said materials was carried out by ..... of ..... traction and haulage engineers, as sub-contractor for and on behalf of the said .....

The vehicles used to convey the said materials were heavy waggons constructed to carry a load of some 5 tons each, drawn by steam traction engines.

The ordinary traffic on the said highway is light, consisting in the main of horse-drawn vehicles, such as farmers' and tradesmen's carts and private carriages.

During the said period an exceptional burden was imposed upon the said highway by the conveyance of the said materials over the same in the manner above described.

The cost of repairing the said highway during the said financial year has been £332 16s. 7d. exclusive of establishment charges, as against an average cost of under £100 per mile in respect of that highway and all other similar highways in the urban district during the preceding five years, showing an increased expenditure for the year in question on the said highway known as Upper Cimla-road of at least £270.

There was no other cause than the damage arising from the weight and traffic consequent upon the conveyance of the said building and engineering materials for the above-mentioned increased expenditure in repairing the said highway.

And I certify that such weight and traffic were excessive and extraordinary, and that, having regard to the average expense of repairing highways in the neighbourhood, extraordinary expenses have been incurred by you by reason of the damage caused by such weight and traffic.

Dated this thirtieth day of October, 1913.

DAVID MORGAN JENKINS.

Surveyor of the Neath Urban District Council."

A formal resolution of the council was passed in the general terms of the form given in the appendix to Lumley's book, which read as follows:

"The certificate of the council's surveyor, dated ..... having been read and considered, and

appearing thereby to the council that having regard to the average expense of repairing highways in the neighbourhood extraordinary expenses have been incurred by the council in repairing the highway known as [illegible] leading from the [illegible] railway station at [illegible] to [illegible] by reason of the damage caused by excessive weight doing the same and of extraordinary traffic thereon occasioned by the progress of certain vehicles employed in the new quarrying and other works recently established at [illegible] by the Welsh Granite Company Limited in the [illegible] railway station to the [illegible] of such works. It is resolved that the clerk to the council be and he is hereby authorised and directed to apply to and attend before the justices in petty sessions at the next hearing of applications for proceedings under the Act of 1878 for recovering the amount of such expenses from the corporation, person or persons by or in consequence of whose extraordinary weight or traffic the same have been occasioned and for such purpose to retain counsel and take all such other steps as he may consider desirable. And that the common seal of the council be affixed to a copy of this resolution."

The town clerk thereupon made broad application to the employer. He contended that the contractor had agreed to pay a sum named towards the additional expense incurred by the council on repairing the highway in question, at the same time [illegible] a copy of the [illegible] certificate and inviting amicable settlement of the claim. None of them, however, made any proposal or suggested entering into the composition agreement provided for by the Act of 1878. An action was consequently commenced in the High Court, well within the prescribed period of six months from the completion of the contract work, and the employers, the contractor and sub-contractor were joined as defendants, but on hearing of the issue of the writ and without waiting for its actual service, the contractor made overtures to the council and a satisfactory settlement was effected.

The legal procedure to be adopted is fully outlined in Lailey's book, and very useful hints are given as to the preparation of the case. It is [illegible] the importance of keeping a road ledger, in which all costs of repair and maintenance of every road in a district are entered and made up each year, cannot be too strongly emphasised.

DEATH OF PROFESSOR HENRY ROBINSON.

We deeply regret to announce the death, which occurred on the 29th ult., at his residence at Wavertree, N.W., of Prof. Henry Robinson, the well-known consulting engineer.

Prof. Robinson, who was seventy-eight years of age, was in 1850 a student in the engineering department of King's College, London, of which he became a scholar and associate after obtaining prizes in various subjects. He then joined the staff of Sir William Armstrong at Elswick, after which he commenced practice as a civil and consulting engineer at Westminster. For nearly half a century he was engaged in designing and carrying out many important railway, water supply, sewerage, foreshore protection, hydraulic, electric lighting, piers, mooring and other works. He took an active part in the distribution of energy in towns by hydraulic power, compressed air, and electricity, and designed and carried out at Hull the first public hydraulic-power scheme in the kingdom, described by him in a paper read before the Institution of Civil Engineers. He was for twenty-two years Professor of Civil Engineering at King's College, retiring in 1900, when the distinction of Emeritus Professor was conferred upon him.

Prof. Robinson was a member of the Institutions of Civil, Mechanical, and Electrical Engineers; a Fellow of King's College, the Surveyors' Institution, Fellow and Member of Council of the Royal Sanitary Institute, and was president of the Engineering and Architectural Sections at several of its congresses; an hon. member of the Institution of Municipal and County Engineers; and past-president of the Society of Engineers. He was the author of "Sewerage and Sewage Disposal," and "Hydraulic Power and Machinery," both of which have passed through several editions, and of a very large number of papers and articles read before scientific bodies, and contributed to the technical press.

ISOLATION HOSPITAL ACCOMMODATION IN CORNWALL.

At a recent meeting of the Sanitary Committee of Cornwall County Council it was reported that the Local Government Board had intimated that as a result of visits recently made by their inspector to certain districts in Cornwall where [illegible] the amount of hospital accommodation available throughout the county for the isolation of persons [illegible] was [illegible] rently unprovided with adequate and satisfactory [illegible] serious, and it was highly important that isolation hospital accommodation should be available for every district in the county. The board understood negotiations were proceeding between several authorities in the county with a view to the joint provi- [illegible] board, however, that the accommodation for small-pox and other infectious diseases required for the districts in question and other areas in the county would be best provided by the county council under a general scheme. It might be found practicable in [illegible]

Dr. Clarke, the acting county medical officer, reported that the isolation hospitals in the county, excluding small-pox, were provided in nine districts, thirty-three districts being unprovided. As the district councils had for the most part failed to provide the necessary accommodation, the Local Government Board, by their letter, made the county council equally or more responsible. The county council must now consider themselves responsible for taking measures to isolate any infectious diseases that occurred in their county in districts unprovided with isolation hospitals. It was unlikely that the Local Government Board would take any drastic action in the matter of ordinary isolation hospitals owing to the enormous expenses entailed. To satisfy the requirements of the Local Government Board £20,000 would not be too much as regarded hospitals, as they refused to lend money on ordinary temporary hospitals. About nine hospitals would be necessary. It would be possible for the district councils to [illegible] than could be done by the county council, because they could erect temporary buildings out of current expenses. At present cerebro spinal meningitis, or spotted fever, was causing difficulty in some dis- [illegible] The county council could threaten that if the district councils did not make provision for isolation hospitals it would be necessary for the county council to do so. The position the Local Government Board took up was that local government was on its trial, and if the county councils failed to act more power would be taken from Parliament by the Local Government Board. He was afraid the Local Government Board would then become an autocratic authority and pay little regard to the desires of local authorities.

The appointment of a committee to inquire into the matter was agreed upon.

Deptford Slipper Baths.—In our description last week of these buildings we omitted to state that Messrs. A. C. W. Hobman & Co., Limited, South Bermondsey, S.E., are supplying the artificial stone dressings and asphalt for the damp-course on the roofs.

Expensive Building Material. The greatly increased cost of building materials is shown in the fact that, whereas the cost of timber required for a labourer's cottage was £28 10s. before the war, it is now £42 10s. This was the price mentioned at a meeting of the Eastbourne No. 3 Rural District Council.

Bridge Building in Middlesex.—At their last meeting Middlesex County Council approved plans of new bridges on the Great West road (A 4) at Osterley Park over the Hounslow and Metropolitan Railways, (2) at Syon Lane over the London and South-Western Railway. It was also agreed that White Bridge, Brentford, should be maintained as a county bridge after it has been conveyed to the county council by His Majesty's Office of Works and has been rebuilt.

Institution of Municipal and County Engineers.

MEETINGS IN LONDON AND THE PROVINCES.

No fewer than four district meetings of the Institution of Municipal and County Engineers were held last week-end, and we append reports of the several gatherings, two of which took place at Westminster, one at Cardiff, and the other at Taunton.

SOUTH-WESTERN DISTRICT MEETING AT TAUNTON.

A successful meeting of the South-Western District of the Institution of Municipal and County Engineers was held at Taunton on Saturday. Those present included Messrs. Samuel Hutton (Exmouth), W. P. Robinson (Devon County), W. H. Chowins (Burnham), C. Oliver Baines (Paignton), J. Siddalls (Tiverton), Reginald Stephens (Ilminster), G. Ponsford (Exmouth), Edward Stead (Somerset County), Francis Parr (Bridgwater), F. W. Jones (Frome), F. Folland (Somerset County), W. A. Collins (Bridgwater Rural), Geo. Alves (Glastonbury), P. F. Spiller (Devon County), D. Edwards (hon. district secretary, Taunton), members; Councillor J. C. Lane (Taunton), A. J. Mildon (Tavistock), R. N. Finch, F. H. Tomes and J. H. Westlake (Taunton), and Charles Durie (Williton Rural), visitors. The arrangements for the day were ably carried out by the hon. district secretary, who left nothing wanting for the comfort and convenience of the party.

The Mayor, who was supported by the deputy-mayor (Alderman F. W. Penny), extended a cordial welcome to the members. His Worship said he trusted the gathering would be productive of good to the members and different corporations represented, and that all present would spend a profitable and enjoyable time.

Mr. F. Parr (Bridgwater), who was elected to the chair in the absence of the district chairman, Mr. James Paton, of Plymouth, moved a hearty vote of thanks to his Worship for his kind reception. They all appreciated coming to a town like Taunton, where so many good public works had been carried out. Both young and old could learn something, and they all ought to endeavour to gain as much knowledge as they possibly could from what Taunton could show them.

Mr. S. Hutton (Exmouth) seconded the vote of thanks, which was supported by Mr. J. Siddalls (Tiverton), and carried with acclamation.

The Mayor, having acknowledged the compliment, subsequently left the chair, and the business of the meeting was proceeded with.

The hon. district secretary, Mr. D. Edwards, Assoc.M.Inst.C.E., borough engineer and surveyor of Taunton, then read communications of apology for absence from Messrs. Jas. Paton (Plymouth), S. F. Churchward (Dawlish), W. North (Honiton), E. Y. Saunders (Barnstaple), H. A. Garrett (Torquay), L. D. Thompson (county surveyor, Cornwall), and T. Moulding (Exeter).

ELECTION OF EXECUTIVE COMMITTEE.

The following gentlemen were elected on the Executive Committee: Cornwall—Messrs. L. D. Thompson and E. D. Groves (St. Austell); Devon—Messrs. H. A. Garrett (Torquay), S. Hutton (Exmouth, J. Siddalls (Tiverton), and W. P. Robinson (Devon County); Somerset—Messrs. F. W. Jones (Frome), F. Parr (Bridgwater), W. A. Collins (Bridgwater Rural), and R. Stevens (Chard Rural); Dorset—Messrs. S. J. Harris (Weymouth) and F. H. McDonnett (Lyme Regis).

"SWEATING WAGES."

Mr. C. O. Baines (Paignton) introduced an important matter to surveyors generally. He said: "You will doubtless have noticed in the volumes of The Surveyor a list of duties, printed *in extenso*, relating to the appointment of surveyor to the Rural District Council of St. Germans, Cornwall, together with comments on this and other appointments of a similar nature. For a number of years the conditions of these positions have become more and more ridiculously restricted and onerous in character, with a corresponding degree of smallness in salary—in fact, sweating wages. I can use no other term, and it is indeed difficult adequately to describe one's feelings within the limits of polite language on coming across cases of this kind. I make no attack upon any individual or council, but I want this institution to bring what influence it can to bear upon the powers that be in order to improve matters for the members of our profession." Mr. Baines also referred to a case at Abingdon, which he considered was practically on all fours with that of St. Germans, and moved a resolution requesting the council to adopt some method of preventing a recurrence of such appointments.

Mr. S. Hutton (Exmouth) said he would second the motion to put a discussion in order. At the same time he was against anything which might tend to make the institution a kind of trade union.

After discussion, the motion, on being put, was lost, and Mr. Baines remarked: Very well, if you rural gentlemen will not help yourselves it is your own fault.

THE CANVASSING QUESTION.

Mr. Hutton brought up the question of the methods adopted by certain districts in the North of canvassing for votes for representation on the council of the institution, and proposed the following resolution: "That this meeting of the South-Western District of the Institution of Municipal and County Engineers strongly protests against canvassing for seats on the council either by person or proxy, and especially condemns the methods adopted by Messrs. J. S. Brodie and A. W. Bradley in issuing a circular canvassing for votes for persons, and that the council of the institution be asked to take such steps as are necessary to prevent a recurrence of such methods." He pointed out that such methods were unfair to such districts as the South Wales and South-Western Districts, inasmuch as the number of members was very much less than those in the populous areas of the North.

Mr. C. O. Baines (Paignton) seconded the motion; but an amendment was moved by Mr. W. P. Robinson (Devon) and seconded by Mr. J. Siddalls (Tiverton): "That this South-Western District Committee object to the practice of canvassing, and asks the council to take such steps as are necessary to prevent a recurrence of the practice."

On being put the motion was carried.

HEAVY LOCOMOTIVE TRAFFIC.

Mr. W. P. Robinson remarked that a departmental committee had been appointed by the Government to consider the question of damage to roads by heavy locomotive traffic—a question particularly affecting rural districts. He noticed that the Eastern District of the institution had resolved that opinions of all other districts in the kingdom should be obtained as to what steps it was necessary to take. No doubt they would be receiving a letter from the institution shortly asking the opinion of the district, and he moved a resolution that the matter be referred to the committee of the South-Western district to consider the questions referred to the departmental committee recently appointed to deal with locomotive traffic, and that that committee be authorised to present such statements as they deem desirable to the council of the institution in order to ensure representative evidence being submitted to the departmental committee.

Mr. E. Stead seconded, and the motion was carried.

The following special committee was appointed, and will meet at Exeter shortly after Easter: The county surveyors of Somerset, Devon (No. 2 Division) and Cornwall, with the following urban and rural representatives: Urban—Messrs. Siddalls, Moulding, Jones, Parr, Harris and Groves; rural—Messrs. Millard, Collins, [illegible] third to be left to the chairman and secretary to appoint.

Mr. Baines suggested that the new surveyor for St. Germans be appointed. (Laughter.)

LUNCHEON.

At the invitation of the Mayor, the members and others partook of luncheon in the municipal hall, an excellent menu being provided.

After the repast a few toasts were honoured.

The first, "The King," was musically honoured.

"The Taunton Corporation" was submitted by Mr. F. Parr, who congratulated the town and its surveyor upon the attractive municipal buildings which had been erected, and various other works which had been carried out in recent years.

The Mayor, in reply, said that during the thirty years he had resided in the town great improvements had been carried out, and the credit was due to those gentlemen who had gone before and inaugurated the improvements, and to those to whom had been entrusted the plans of the improvements. The health of the borough was everything. They were very desirous of doing away with the many courts in Taunton, and to this end the town council had erected a batch of workmen's dwellings, which it was proposed to supplement by another block.

The Deputy Mayor (Alderman F. W. Penny) proposed "The Institution of Municipal and County Engineers," which, he said, was a sort of Brotherhood who put their stock of knowledge together to benefit the whole of the members. So far as Taunton was concerned, they were pleased that Mr. Edwards came there ten years ago—just about the time when he himself became a member of the corporation, and he had never regretted giving his vote for the appointment of so well-qualified a surveyor. Taunton had developed along the right lines, and he felt sure under the present officials it would go on and prosper.

The toast was responded to by Mr. Edward Stead, the county surveyor of Somerset, and Mr. J. Siddalls, borough surveyor of Tiverton.

A discussion on public baths—which will be reported in our next issue—followed. At the close of the proceedings the members were entertained to tea by the mayor.

SOUTH WALES DISTRICT MEETING AT CARDIFF.

Mr. W. Harpur, the district chairman, presided on Saturday last at a South Wales District meeting of the Institution of Municipal and County Engineers held at the City Hall, Cardiff, and at which there were present Messrs. H. A. Clarke (Briton Ferry), hon. district secretary, R. E. David (Llantrisant), F. M. Greenhill (Cardiff), W. L. Harpur (Brecon County), L. Holden (Cardiff), W. H. Hughes (Cardiff), D. M. Jenkins (Neath), D. R. Morgan (Cardiff), G. A. Phillips (Glamorgan County), J. J. Quirk (Brynmawr), H. C. Rimell (Cardiff), and E. Whitwell (Abersychan).

The Chairman, in welcoming the members, commented on the period which had elapsed since the last meeting of the district took place. The difficulty, he observed, was to get anyone to read a paper or to show them over works of interest.

ELECTION OF OFFICERS.

Mr. H. A. Clarke (Briton Ferry) was re-elected district secretary, Mr. G. A. Phillips (Glamorgan County) as district representative on the council, and Mr. W. Harpur (Cardiff) as district chairman.

The District Executive Committee was elected as follows: Glamorganshire—Messrs. D. M. Jenkins (Neath), J. C. Pardoe (Barry), F. Read (Gellygaer), and J. R. Heath (Swansea); Monmouthshire—Messrs. H. Tremelling (Newport) and E. Whitwell (Abersychan); Carmarthenshire—Mr. J. H. Montgomery (Llanelly); Breconshire—Messrs. H. L. Griffiths (Brecon), W. L. Harpur (Brecon County), and J. J. Quirk (Brynmawr); associate members—Messrs. D. L. Jones (Merthyr), G. H. Bell (Swansea), and I. F. Shellard (Newport).

Mr. D. M. Jenkins, borough engineer of Neath, next presented a paper entitled "Notes on Extraordinary Traffic on Highways," which appears on another page of this issue. Pressure of space compels us to hold over until next week the report of the discussion which followed.

Before the close of the meeting a vote of condolence was passed with Mr. R. H. Wyrill, the borough engineer of Swansea, in the loss of his wife—reported in last week's Surveyor. It was also decided to forward an expression of the members' sympathy with Mr. G. Bell, who was recently compelled, owing to a breakdown in health, to relinquish his appointment as borough surveyor of Swansea. Mr. Bell, said the chairman, Mr. Harpur, in putting the motion, was a man of sterling character and great ability, and they were all sorry that he had been obliged to give up work.

METROPOLITAN DISTRICT MEETING AT WESTMINSTER.

A meeting of the Metropolitan District was held on Friday night at the offices of the institution, 92 Victoria-street, Mr. H. Percy Boulnois, in the absence of the district chairman, Mr. J. Patten Barber, being voted to the chair. The members present were: Messrs. O. Cattlin (Holborn), T. W. A. Hayward (Battersea), C. Chambers Smith (Westminster), W. F. Loveday (Stoke Newington), P. G. Killick (Finsbury), O. E. Winter (Hampstead) and N. Scorgie (Hackney, hon. district secretary).

THE QUESTION OF A CIRCULAR.

Mr. Scorgie stated that he had received from the council of the institution a letter stating that their attention had been drawn to the practice apparently adopted in some districts of circularising members of the district with regard to supporting certain candidates for election as ordinary members of the council. In view of the fact that the representation of each district was secured by the election of district representatives as ordinary members of the council, the council considered the practice of issuing such circulars as unnecessary and undesirable.

Mr. Hayward said he hoped they would write to the council stating that they heartily approved the action they had taken in this matter. It was, he thought, a most undesirable thing that circulars should be sent round canvassing for votes. He moved that they approve the action of the council.

Mr. Killick seconded.

Mr. Scorgie remarked that the action referred to did not affect this district one iota, for they had not decided to circularise. He thought it would be sufficient if they received the letter from the council.

Mr. Hayward said his point was this: He did not object to a district doing what they pleased in their own district, but he considered it was grossly unfair for a district to select a number of names and ask their members to vote for them *en bloc*. Why should one district strive to get all the representation at the expense of others?

Mr. Chambers Smith supported the view of Mr. Scorgie. The North Country members suffered a good deal of soreness because they considered they were not properly represented. It was the same in Ireland and Scotland, and the circular represented an effort to set things right.

Mr. Scorgie observed that one effect of the circular complained of was that the voting exceeded anything in the history of the institution.

Mr. Hayward said he did not think that was known.

Mr. Scorgie: You may take it from me.

Eventually the proposition of Mr. Hayward was carried by five votes to two.

DISTRICT CHAIRMAN.

Mr. J. Patten Barber, district chairman, wrote asking that his name should not be proposed as district chairman. The district, he added, would be better served by one who had more time at his disposal and more liberty than he had.

Upon the proposition of Mr. Hayward a cordial vote of thanks was passed to Mr. Patten Barber for his services, and it was agreed to approach Mr. G. W. Humphreys, chief engineer to the London County Council, on the subject of filling the vacant office.

HON. DISTRICT SECRETARY.

Mr. Scorgie was unanimously re-elected district secretary, and thanked for his past services.

DISTRICT REPRESENTATIVE.

Mr. O. E. Winter was re-elected district representative.

EXECUTIVE COMMITTEE.

The election of the District Executive Committee was postponed to the next meeting of the district.

The question of holding a series of winter meetings combined with social evenings was referred to the Executive Committee to prepare a synopsis of subjects for discussion; but it was definitely arranged, upon the proposition of Mr. Winter, to hold a meeting on April 30th, at 7.30, for the discussion of heavy motor traffic and the roads, which is now under the consideration of a Government Committee, invitations to be issued to members in Greater London.

SOUTH-EASTERN DISTRICT MEETING AT WESTMINSTER.

A South-Eastern District meeting was held on Friday evening at the offices of the institution, 92 Victoria-street, Westminster. In the absence of the district chairman, Mr. A. Dryland, owing to illness, Mr. A. E. Prescott (borough engineer of Eastbourne) was voted to the chair. The members present (including the chairman) were Messrs. J. W. Redfern (Gillingham), C. Chambers Smith (Westminster), R. Chart, junr. (Croydon), A. H. Quick (Thornton Heath), H. F. Chapman (Kent), F. Wilkinson (Wimbledon),

and H. W. Bowen (West Sussex, hon. district secretary).

DISTRICT CHAIRMAN.

The chairman stated that he had received from Mr. Dryland a letter expressing a wish to be relieved of the duties of district chairman by somebody who could give more time to the work than he was able to. He had replied asking Mr. Dryland to reconsider his decision, and had so far not received an answer.

Mr. H. T. Chapman nominated Mr. Dryland as district chairman, and Mr. Prescott having seconded the proposition, it was carried *nem. con.*

DISTRICT REPRESENTATIVE.

Mr. F. Wilkinson proposed the nomination of Mr. H. W. Bowen as district representative.

Some discussion, initiated by Mr. R. Chart, took place on the subject of changing the district representative so as to give as many members as possible experience of the office. Mr. J. W. Redfern thought it would be a mistake to change the representative every year, and the chairman agreed with this view, because it took a certain amount of time for the gentleman to learn the duties. Mr. Wilkinson also thought a year rather a short time to hold the office. After further discussion the nomination of Mr. Bowen was agreed to unanimously.

DISTRICT SECRETARY.

Mr. Bowen (who returned thanks for his nomination as district representative) having expressed a wish to retire from the office of hon. district secretary owing to pressure of work,

The chairman nominated Mr. J. W. Redfern.

Mr. Chart seconded, and the motion was carried.

EXECUTIVE COMMITTEE.

The following gentlemen were nominated to the Executive Committee:

Kent: Messrs. F. Harris (Tonbridge), H. W. Longdin (Penge), H. T. Chapman (Kent) and S. Sills (Rochester).

Surrey: Messrs. J. H. Brierley (Richmond), W. H. Grieves (Sutton), R. M. Chart, junr. (Croydon), and F. Wilkinson (Wimbledon).

Sussex: Messrs. A. E. Prescott (Eastbourne), F. Roberts (Worthing), W. E. Wickham (East Grinstead) and O. A. Bridge (Bognor).

VOTES OF THANKS.

Mr. Redfern proposed a vote of thanks to the district chairman (Mr. Dryland), the district representative (Mr. Harris), and the hon. secretary (Mr. Bowen) for the excellent service they had given during the past year.

Mr. Chapman seconded, and the chairman supported the proposition, remarking that they all appreciated the work that had been done on their behalf by the gentlemen named. They hoped the three gentlemen elected would work equally well during the ensuing year.

Mr. Bowen, in acknowledging the compliment, alluded to a circular letter that had been sent out from certain districts (and from the very advocates) the return of certain members to the council. He knew it was ought to condemn the [illegible] because he did not think it was right to [illegible] bers in this way.

The chairman said he had protested strongly against such procedure as he considered it most unfair. It [illegible] gentlemen [illegible] the council of the [illegible] was to hold a meeting and then [illegible] themselves.

Mr. Wilkinson proposed to leave [illegible] brought before the council at the next [illegible].

Mr. C. Chambers Smith stated that it had already been before the council.

The secretary (Mr. Robinson) confirmed this, and stated that the council had sent out a letter expressing disapproval of the issue of such a circular.

The vote was carried and the proceedings terminated.

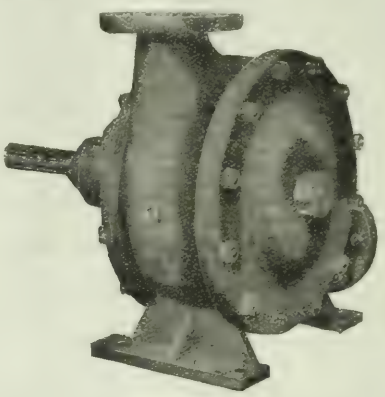
Corrosion of Iron and Steel Pipes.—At a meeting of the Institution of Sanitary Engineers to be held at Caxton Hall, Westminster, on Wednesday, the 14th inst., Mr. W. J. E. Binnie, M.Inst.C.E., will present a paper entitled "Corrosion of Iron and Steel Pipes, and the Protective Methods to be Adopted." The chair will be taken at 8 p.m. by Mr. A. P. I. Cotterell, the president.

ROTOPLUNGE SEWAGE PUMPS.

Among the most recent developments in pumping machinery for sewage or semi-solids, such as tar, oil, sludge, &c., is the Rotoplunge pump, which contains no valves of any shape or form, and which cuts up and disintegrates the sewage so that it can be handled properly.

The Rotoplunge pump overcomes in a very thorough fashion the common troubles of variation of head and loss of water through the formation of gas or air leakage, and, moreover, its action is entirely positive. We illustrate a sectional diagram showing the construction of the pump.

The pump consists of eight parts only: A the body



or casing, which has secured to it two covers, B and C. Inside is a rotor D, which is secured to the shaft; two piston castings (forming four pistons E and F working in cylinder bored in the rotor D. Two rollers, G and H, which work on the eccentric boss on the cover B. The suction side of the pump casing is separated from the delivery side by means of two division pieces of metal (J and K, Fig. 1), having only a clearance between their surfaces and that of the rotor; these are called shoes.

The action of the pump can be clearly followed by reference is made to the illustration.

The pump rotates in the direction indicated by the arrow (Fig. 1), and it will be clear, owing to the relative positions of the centre of the rotor shaft

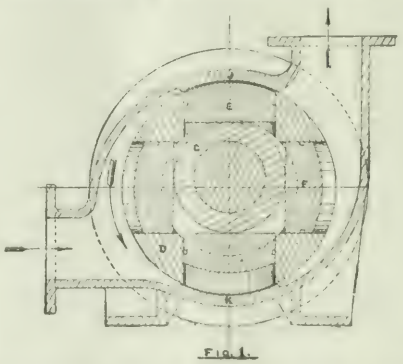


FIG. 1.

and eccentric boss that any cylinder [illegible] pass the upper shoe will have its piston in its extreme outward position. As the [illegible] cylinder moves down in a counter clockwise direction, its piston will move inwards, as shown by the other cylinder on the left-hand side in Fig. 1, until in its lower position the piston will be in its extreme inward position. The result of this action is that as the cylinders pass the portion of the working chamber which connects with the inlet pipe they draw in charges, which are nearly trapped in the cylinder as pass the lower shoe.

On the other side of the vertical centre line the pistons move outwards and expel their charges into the discharge pipe, finally reaching their extreme

ROYAL COMMISSION ON SEWAGE DISPOSAL.

ISSUE OF NINTH AND FINAL REPORTS.

[The Ninth and Final Reports of the Royal Commission on Sewage Disposal were issued on Wednesday, and the Final Report is reproduced herewith practically in extenso. Included in the Final Report is a summary of the conclusions and recommendations contained in the Ninth Report, which will be dealt with in detail in these pages in a subsequent issue.]

In this our Final Report we recapitulate briefly the main conclusions at which we have arrived as the result of an inquiry which has extended over a period of sixteen years.

Of the nine reports which we have issued, four deal mainly with the purification of domestic sewage discharging into streams (Interim, Second, Fifth, and Eighth Reports); two with the discharge of sewage into tidal waters (Fourth and Seventh Reports); and three with the discharge of manufacturing effluents (Third, Sixth and Ninth Reports).

Our Fourth, Sixth and Seventh Reports relate to investigations of a somewhat special nature which we were requested to undertake with a view to suggesting a solution of particular problems which had arisen. We considered that the conclusions at which we arrived were of sufficient general importance to warrant us in dealing with them as part of our inquiry.

The subject matter of our Fourth Report—the discharge of sewage into tidal waters—was brought specially to our notice by the Local Government Board, who had been moved to take action in consequence of a number of serious outbreaks of enteric fever, ascribed to the eating of shellfish obtained from sewage-polluted water.

Following on our recommendations the shellfish owners agreed to close sewage-polluted layings, and [illegible] to consume [illegible] other articles of diet than they were before the time of our inquiry. But no general recommendations for securing [illegible] and effective supervision and control, both of sewage outfalls and shellfish beds, have not yet been adopted.

Our Sixth Report was a special report on the purification of distillery waste. The investigation of this question was pressed upon us by representatives of the Scottish malt distillery industry, who found themselves unable to comply with the demands made by riparian owners for the protection of the salmon fishery.

As the result of our experimental work, a plant was erected for the purification of distillery waste, which, during the past few years, has been proved capable of producing at reasonable cost an effluent which is not injurious to fish, and other similar plants are in process of erection.

The work in connection with our Seventh Report was undertaken at the request of the Local Government Board for Ireland.

A very serious nuisance, due to the decay of seaweed, had arisen in Belfast Lough, into which the sewage of Belfast was discharged. As it appeared that the growth of the weed was encouraged by sewage pollution, a costly scheme for the complete purification of Belfast sewage was submitted by the corporation to the Local Government Board. Doubts having been expressed as to whether by these means the evil would be remedied and its occurrence prevented, the Local Government Board, knowing that we had had some evidence on the subject in connection with our inquiry into the pollution of tidal waters, desired to know whether we proposed to investigate further the best and least expensive means of treating sewage so as to avoid similar nuisances.

We considered the matter was one of sufficient general importance to justify us in making inquiry in regard to it.

We have recalled the particular circumstances in which these three reports were written because they embodied the results of special investigations which, in the absence of a permanent authority for dealing with such questions, we felt bound to undertake. They form, however, an integral part of our general inquiry.

THE NINE REPORTS SUMMARISED.

We append a summary of all our reports, in chronological order.

INTERIM REPORT. Cd. 685 [1901].

Our First Report was of an interim character and contained the following conclusions:—

(1) No land is entirely useless for purification of sewage, "but in the case of stiff clay and peat lands the power to purify sewage seems to depend on the depth of the top soil."

"There are, of course, numerous gradations in the depths of the top soil which are met with in Nature, and it is not easy to draw the line between lands which contain a sufficient depth to purify their use and lands which do not.

"We are, however, forced to conclude that peat and stiff clay lands are generally unsuitable for the purification of sewage, that their use for this purpose is always attended with difficulty, and that where the depth of top soil is very small, say 6 in. or less, the area of such lands which would be required for effluent purification would in certain cases be so great as to render land treatment impracticable.

(2) ". . . we are satisfied that it is practicable to produce by artificial processes alone either from sewage or from certain mixtures of sewage and trade refuse such, for example, as are met with at Leeds [illegible] effluents which will not putrefy, would be classed as good according to ordinary chemical standards, and which might be discharged into a stream without fear of creating a nuisance.

"We think, therefore, that there are cases in which the Local Government Board would be justified in [illegible] under proper safeguards, the present rule as regards the application of sewage to land.

(3) " . . . as a result of a large number of examinations of effluents from sewage farms and from artificial processes we find that while in the case of effluents from land of a kind suitable for the purification of sewage there are fewer micro-organisms than in the effluents from most artificial processes, yet both classes of effluents usually contain large numbers of organisms, many of which appear to be of intestinal derivation, and some of which are of a kind liable, under certain circumstances at least, to give rise to disease.

"We are of opinion, therefore, that such effluents must be regarded as potentially dangerous, and we are considering whether means are available and practicable for eliminating or destroying such organisms, or, at least, those giving rise to infectious diseases.

(4) "It is of the utmost importance that the simplest possible means should be provided for adequately protecting all our rivers," . . . and "it will be desirable, probably for some time to come, that

scientific experiments should be carried on in order to ascertain all the real dangers of pollution, against which they should be protected.

"In the present state of knowledge, and especially of bacteriology, it is difficult to estimate these dangers with any accuracy, and it seems quite possible that they should be either exaggerated or undervalued according to the predisposition of those who have to deal with them. An authority, guided by medical considerations, might not unnaturally be inclined to insist on a degree of purity which may ultimately prove in certain cases to be uncalled for, while another authority, with its mind fixed upon economy, might shrink from taking essential precautions.

". . . the general protection of our rivers is a matter of such grave concern as to demand the creation of a separate commission, or a new department of the Local Government Board, which shall be a supreme rivers authority, dealing with matters relating to rivers and their purification, and which, when appeal is made to them, shall have power to take action in cases where the local authorities have failed to do so."

SECOND REPORT. Cd. 1178 [1902]

Our Second Report was a formal document covering certain scientific papers which were presented as an appendix to that report.

THIRD REPORT. Cd. 1486 [1903]

In our Third Report we dealt with the relations between local authorities and manufacturers in regard to the disposal of manufacturing effluents. We found that the present state of the law was most unsatisfactory, that the attitude of local authorities towards manufacturers had differed widely, and that many manufacturers were seriously handicapped. Our investigations showed that purification of trade effluents by the local authority is in the great majority of cases practicable; purification by the manufacturer is in some cases difficult, if not impracticable; while purification by the manufacturer would generally be more costly than purification by the local authority.

It also appeared that the local authorities, as well as the manufacturers, were of opinion that there should be laid on the local authority a distinct obligation to receive trade effluents.

Our recommendations on this point were as follows:—

"We are, therefore, of opinion that the law should be altered so as to make it the duty of the local authority to provide such sewers as are necessary to carry trade effluents as well as domestic sewage, and that the manufacturer should be given the right, subject to the observance of certain safeguards, to discharge trade effluents into the sewers of the local authority if he wishes to do so.

"We do not think it possible to provide, by direct enactment, what these safeguards should be. In each district it would probably be desirable that the local authority should frame regulations which should be subject to confirmation by a central authority. In most cases, however, these regulations could provide definite standards for the different manufacturers as regards preliminary treatment, and it appears from the evidence that manufacturers would much prefer to have standards to work to.

"Power to vary the standards or to dispense with them altogether in special cases would be necessary.

"Although the duty of receiving trade effluents should, we think, be imposed on the local authority, cases may arise in which they should be wholly or partially relieved of it.

"For example, we find that in some instances the effluent discharge from the manufactory is of a composite character, the greater part of which might with advantage be easily dealt with by the manufacturer if it were kept separate. In such cases we think the manufacturer would generally be willing to adopt this course, but provision is necessary for those cases in which the local authority and manufacturer could not agree.

"Further, although we have received no conclusive evidence to show that there are trade effluents which could not be purified by the local authority, we do not deny the possibility of such cases arising.

"And it is possible that in some cases, as, for example, of a large manufactory being newly established in a small district, it might be necessary to relieve the authority of the obligation to treat the trade effluent, or to enable them to exact some special contribution from the manufacturer, not only for the cost of treatment, but also towards capital expenditure.

"It is obvious, therefore, that some tribunal will be required for settling differences between the local authority and the manufacturer, and for relieving the local authority in exceptional cases, either wholly or partially, of their obligation to provide sewers and disposal works of sufficient capacity for trade effluents as well as ordinary sewage.

"We are of opinion that generally no special charge should be made on the manufacturer in those cases in which the regulations as to preliminary treatment are complied with.*

"As we have already stated, it is desirable that, wherever practicable, some preliminary treatment should be carried out by the manufacturer.

"But where the manufacturer is unable to comply with these regulations, we consider that the local authority should be empowered to make a special charge.

"Power should also be granted to make a special charge, even when preliminary treatment is adopted, where there are exceptional circumstances as regards volume, quality, or otherwise."

SETTLEMENT OF DIFFERENCES BETWEEN LOCAL AUTHORITIES AND MANUFACTURERS

The chief questions upon which we considered that differences might arise were:—

(1) The refusal of a local authority to allow a particular trade effluent to enter their sewers.
(2) The refusal of a local authority to construct or enlarge sewers for the purpose of a particular manufactory.
(3) The question of varying general regulations as to preliminary treatment by the manufacturer.
(4) The amount of the special charge to be imposed on the manufacturer.
(5) The removal of sludge.

The balance of opinion we found to be strongly in favour of the view that for the settlement of these questions it is necessary to constitute a central board possessing adequate technical knowledge, such as the Supreme Rivers Authority which we recommended in our Interim Report.

As regards this matter we reported as follows:—

"We have been struck by the large sums which have been expended in appeals to courts, but, apart from the question of expense, we are strongly of opinion that the ordinary courts are not suitable for the determination of these questions, and we venture to think that the judgment of the Master of the Rolls in the case of *Attorney-General* v. *Whitmore*, to which we have already referred, clearly supports this view. He comments that 'the evidence was very complicated, the expert witnesses who were called not only giving evidence quite inconsistent with one another, but some of them giving evidence in cross-examination which was quite inconsistent with what they said in examination in chief,' might apply to many similar cases.

"The scientific questions to be solved would in most instances be capable of actual determination by a properly equipped central authority, and there can be little doubt that such direct proof would be far less costly than the process of endeavouring to arrive at the truth through the evidence of 'expert' witnesses in a court of law.

"Moreover, the matters to be determined include not only scientific questions on which witnesses may be expected to differ, but also considerations of an administrative character which should more properly be dealt with by a Government Department.

"Further, we find that a central authority possessing adequate technical knowledge would command the confidence of local authorities and manufacturers.

"In our opinion a properly equipped central authority is essential, and we unhesitatingly recommend the creation of such an authority.

* See, however, paragraph 10 of the Ninth Report, in which we stated, "Our own additional experience, and the further evidence which has been laid before us, indicate that it may be desirable that local authorities should have a general power to make a charge, provided that the charges were lower in the case of effluents which had been subjected to preliminary treatment in accordance with the regulations."

In the interests of [illegible] we consider that the trade of the country, we consider [illegible] the Board's experience that the changes in the law which we have mentioned [illegible] would be useful. But these changes would not involve any departure of such a kind from the present system of a central authority for the determination of differences between the local authority and the manufacturer.

In the settlement of these differences by [illegible] the ordinary course of [illegible] before arbitration with the [illegible] to be avoided.

We also recommended that [illegible] the protection of rivers rivers boards should be [illegible] for other parts of the country similar [illegible] which already exist in Lancashire and Yorkshire, and that these boards should be empowered to determine, subject to appeal to the central authority, certain of the differences between local authorities and manufacturers.

We further advised that it should be the duty of rivers boards to report public water supplies, and to report to the central authority any cases of dangerous pollution of such supplies which they may detect, and that the central authority should be empowered after due inquiry to require the purveyors of the water to [illegible] as, in the opinion of the central authority, were [illegible] ing the danger.

We also recommended that the central authority might, with the aid of the rivers boards, very properly collect such information as is available [illegible] by pumping from mines, and in regard to the abstraction of water from one district for the supply of another district, to the detriment of the water supply of the district from which the water was taken. We considered that the collection of such information should precede the consideration of the question whether legislative interference in regard to these matters is desirable.

We may here add [1914] that it appears to us desirable that a rivers board should have [illegible] *stands* to appeal to [illegible] in regard to any reference affecting [illegible] district.

FOURTH REPORT—Cd. 1884 [1905].

In our Fourth Report we dealt with the question of tidal waters, with special reference to the contamination of shellfish. We stated that

"Your Commissioners, in framing the terms of the order of reference to them, assumed that a considerable number of persons [illegible] were then ill [illegible] to be caused by the consumption of shellfish which had been exposed to sewage contamination; but in the present state of knowledge we do not think it possible to make an accurate numerical statement of any such alleged [illegible] the whole country.

"There can, however, be no doubt that the evil [illegible] and requires a remedy."

Our main recommendations in dealing with the evil was stated in the following terms:—

After considering and weighing the whole of the evidence, together with the results of our own investigations and local inquiries, we are strongly of opinion that the only way in which the evil can be effectively dealt with is by placing tidal waters under the jurisdiction of a competent authority, and conferring on that authority power to prevent the taking of shellfish for human consumption from any position in which they are liable to risk of dangerous contamination, and to enforce restrictions as regards pollution, and as regards waters, foreshores, pits, ponds, beds and layings in which shellfish are [illegible] stored, as and when required.

"For this purpose the powers of the authority must be elastic. The case of each river and estuary is a problem by itself, and it would not be practicable to fix by enactment any standard or standards which would be generally suitable to the widely different conditions of different cases. Moreover, as the conditions are shifting in character, it is necessary to provide some permanent machinery by which restrictions can be varied."

After considering various alternatives [illegible] that:—

We [illegible] River Boards should be [illegible] whom to vest the local control which we are now [illegible] over tidal waters (estuarial and other), and it is desirable that [illegible] for sanitary purposes. There are [illegible] the sanitary qualities [illegible] alternative to giving them jurisdiction would seem to be to [illegible] central department."

We [illegible]

That the necessary powers should be vested over the pollution of tidal waters, and over waters, foreshores, pits, ponds, beds, and layings where shellfish are grown, fattened or stored, should be vested in the Rivers Boards, subject to appeal to a central authority."

In the [illegible] we dealt with the procedure which the rivers boards and central authority should follow. We also dealt with the question of the means which should be adopted for avoiding danger from the consumption of foreign shellfish.

As regards [illegible] we recommended that [illegible] of shellfish should be guarded against in the case of discharge of sewage into tidal [illegible] we made recommendations dealing with [illegible] matters.

FIFTH REPORT—Cd. 2585 [1905].

The Fifth Report deals chiefly with the relative merits of the various methods available for the [illegible]

[illegible]

Our conclusions are summarised as follows:

"It is practicable to purify [illegible] of tidal waters by means of land treatment or by artificial filters, but [illegible] a central authority [illegible] the two processes.

"The [illegible] to be adopted in the case of [illegible] to purify a sewage [illegible] of sewage purification are, first, what degree of purification is required in the circumstances of that town, and of the river or stream into which its liquid refuse is to be discharged; and, secondly, how the degree of purification required can, in the particular case, [illegible]

[illegible]

"We find that it is generally desirable to remove from the sewage, by a preliminary process, a considerable proportion of the grit and suspended matters before attempting to purify the sewage on land or filters.

[illegible] TANKS.

"[illegible] quiescence is usually sufficient to produce a tank liquor fairly free from suspended solids, but, owing to the fact that [illegible] contains a larger proportion than others of solids that settle very slowly, no general rule can be laid down as to the necessary period of quiescence. With this form of treatment the deposit at the [illegible] be frequently removed [illegible]. The amount of settlement effected does not depend alone upon the period of [illegible] a number of other factors. If the tank liquor is to be treated upon filters of fine material, the period of flow should generally be from ten to fifteen [illegible] the tank should be cleaned out at least once a week.

SEPTIC TANKS.

"All the organic solids present in sewage are not digested by septic tanks, the actual amount of digestion varying with the character of the sewage, the size of the tanks relative to the volume treated, and the frequency of cleansing. With a domestic sewage, and tanks worked at a twenty-four hours' rate, the digestion is about 25 per cent.

"The liquor issuing from septic tanks is bacteriologically almost as impure as the sewage entering the tanks.

"Domestic sewage which has been passed through a septic tank is not more easily oxidised in its passage through filters than domestic sewage which has been subjected to chemical precipitation or simple sedimentation.

"No definite rules can be laid down as to how long a septic tank should be run without cleaning. In the case of small sewage works (serving populations of, say, 100 to 10,000 persons) the tanks should generally be allowed to run without cleaning so long as the suspended matter in the tank liquor shows no signs of affecting the filters injuriously. For larger works it would generally be advisable to run off small quantities of sludge at short intervals of time.

"The rate of flow through a septic tank is a matter in which the needs of each place require special consideration, but at few places should the sewage be allowed to take longer than twenty-four or less than twelve hours to flow through the tank. In no case should less than two tanks be provided, and they should be arranged so that, if necessary, one tank can be used alone.

"As regards digestion of sludge and quality of tank liquor, a closed tank possesses no advantages over an open tank. There is less risk of nuisance if the tank and the feed channels to the filters are covered in.

"By passing septic tank liquor through tanks of a size sufficient to hold about one-quarter of the day's flow, with the addition of from 2 to 3 grains of lime per gallon to the liquor, the suspended solids in the liquor are materially reduced, a considerably larger quantity of the liquor can be treated per cube yard of filter, and the offensive character of the liquor is largely destroyed.

CHEMICAL PRECIPITATION.

"In the case of sewages which contain certain trade waste, and strong sewages from water-closet towns, it is generally desirable to subject the sewage to some form of chemical treatment before attempting to oxidise the organic matter contained in it. In most cases careful chemical precipitation materially aids the deposition of the suspended solids, and facilitates subsequent filtration.

"No general rule can be stated with regard to the capacity of precipitation tanks. With continuous flow an eight hours' rate is usually sufficient to produce a fairly good tank liquor from a domestic sewage of average strength.

"If sewage is allowed to remain quiescent in the tank, two hours' settlement would usually suffice.

RELATIVE COST OF DIFFERENT TANK TREATMENTS.

"In the absence of special circumstances favouring a particular plan, it would appear that there is very little difference in annual cost between the various methods of tank treatment when taken in conjunction with the cost of subsequent filtration through percolating filters, assuming that the kind of filter adopted in each case is that which is best adapted to the particular tank treatment provided.

FILTERS.

"Within ordinary limits, the depth of a contact bed makes practically no difference to its efficiency per cube yard.

"We think that it would be generally inadvisable to construct contact beds of a greater depth than 6 ft., or of a less depth than 2 ft. 6 in.

"For practical purposes, and assuming good distribution, the same purification will be obtained from a given quantity of *coarse* material, whether it is arranged in the form of a deep or of a shallow percolating filter, if the volume of sewage liquor treated per cube yard be the same in each case.

"With regard to percolating filters of *fine* material, if the liquid to be purified were absolutely free from suspended and colloidal solids, and if thorough aëration could be maintained the statement just made for filters of coarse material might possibly hold good for filters of fine material also. In practice, however, these conditions can scarcely be maintained with large rates of flow, and we think that the greatest efficiency can be got out of a given quantity of *fine* material by arranging it in the form of a shallow filter rather than of a deep filter; but we are not in a position to make an exact quantitative statement as to the difference in efficiency of the two forms.

"The amount of sewage which can be purified per cube yard of contact bed or of percolating filter varies —within practical limits—nearly inversely as the strength of the liquor treated. This statement is based on the assumption that the size of the material of which the filter is composed is in each case suitable to the character of the liquor treated, and that the material is arranged at the proper depth to secure maximum efficiency.

"Taking into account the gradual loss of capacity of contact beds, a cubic yard of material arranged in the form of a percolating filter will generally treat about twice as much tank liquor as a cubic yard of material in a contact bed.

"In the case of sewage containing substances which have an inhibitory effect upon the activity of micro-organisms, the working power per cube yard of filter of either type may be more nearly equal. This point, however, is not clearly established.

"Percolating filters are better adapted to variations of flow than contact beds.

"Effluents from percolating filters are usually much better aërated than effluents from contact beds, and, apart from suspended solids, are of a more uniform character. On emptying a contact bed, the first flush is usually much more impure than the average effluent from the bed.

"The risk of nuisance from smell is greater with percolating filters than with contact beds.

"With percolating filters there is apt to be a nuisance from flies, especially with filters constructed of coarse filtering material. In the warmer months of the year such filters swarm with members of the *Psychodidæ*, which, though appearing to breed and develop in the filters, may usually be seen in large numbers on the walls of houses or buildings close to or on the works.

TREATMENT OF SEWAGE ON LAND.

"There is no essential distinction between effluents from land and effluents from artificially constructed filters.

"Effluents from those soils which are particularly well adapted for the purification of sewage contain only a very small quantity of unoxidised organic matter, and are usually of a higher class than effluents from artificial filters as at present constructed and used.

"Effluents from soils which are not well adapted for the purification of sewage may often be very impure.

SLUDGING OF MILL DAMS.

"In any case in which the Rivers Board should be of opinion that the sludging of a mill dam by turning the accumulated sludge into the stream would give rise to a nuisance, and that it would be financially practicable for the millowner to adopt some other method of cleansing the dam, the Rivers Board should be empowered, by notice, to direct the millowner not to turn the sludge into the stream.

"It should be provided that any millowner deeming himself aggrieved by such a direction might, within some fixed period, appeal to the central authority. The decision of the central authority should be final.

"Should any cases arise in which it is important that the sludge should not be turned into the stream, but in which the Rivers Board are of opinion that the cost of adopting any other method of cleansing the dam would be prohibitive to the millowner, we recommend that the Rivers Board should be empowered to represent the case to the central authority, and that the central authority should be empowered, after due inquiry, to direct that the sludge shall not be turned into the stream. If the central authority should be satisfied that the cost of adopting some other method of cleansing the dam would be greater than the millowner could be reasonably called upon to bear, they should be empowered to direct that a portion of the cost should be borne by the local authorities whose districts would be benefited.

EFFECT OF TRADE EFFLUENTS ON SEWAGE PURIFICATION.

"All the trade effluents of which we have had experience interfere with or retard processes of purification to some extent, but we are not aware of any case where the admixture of trade refuse makes it impracticable to purify the sewage upon land or by means of artificial processes, although in certain extreme cases special processes of preliminary treatment may be necessary.

NUISANCE FROM SMELL.

"All sewage works are liable at times to give off unpleasant smells; they should therefore be situated away from dwelling-houses wherever this is practicable.

"The nuisance is apt to be considerably greater where the sewage contains brewery refuse in any quan-

...but on the other hand, the presence of ... trade effluents may ... such matters tend to render the process ... less effective.

"The extent of the right of appeal ... not only on the character of the sewage ... also on the method of treatment adopted.

GENERAL OBSERVATIONS RELATING TO CHOICE OF A METHOD OF SEWAGE TREATMENT.

"The selection of a particular ... should depend primarily on local conditions.

"In a sufficient quantity of good land ... sewage can generally be purified ... an area, land treatment would usually be the ... method to adopt.

"In cases where ... the land ... would generally be ... provide artificial filters.

"Given certain conditions favourable to each process ... little difference in regard to cost between the different forms of land treatment ... ordered along with the ... of the ...

"Single contact will usually suffice to produce a good effluent where the sewage to be treated is weak, and there only after good preliminary treatment. For the purification of partially settled sewage ... but well, or after only partially settled ... average strength, if the ... a good effluent is required ... contact ... while at a sharp ... has to be treated ... contact is necessary unless the preliminary treatment is exceptionally good.

"In nearly every case a greater rate ... per cube yard can be adopted if the material is arranged in the form of a percolating ... than if used in contact beds. In many ... filtration three or four times ... or nearly double what it could be with ... beds.

"Where the liquor to be treated ... suspended matter it ... usually advisable ... filter, whether contact or percolating, with coarse filtering material. Where the preliminary ... effectively removed the greater part of the suspended matter ... less ... the filters.

STORM OVERFLOWS ON BRANCH SEWERS.

"Storm overflows on branch sewers should in most cases ... and should usually be set ... to come into operation until the flow in the branch sewer is several times the maximum normal dry-weather flow at the ... No general rule can be laid down as to the ... in these cases should occur in the branch sewer before ... allowed to pass away by the overflow ... by the Rivers Board, or in districts where there is no Rivers Board the county council, should have power to require the local authority to ... where in their opinion ... unpurified sewage to flow over them. The local authority should have the right to appeal to the central authority in any case in which they consider that the requirement of the Rivers Board ... unreasonable or impracticable of fulfilment.

"The general principle should be to prevent such an amount of unpurified sewage from passing over the overflow as would cause nuisance.

TREATMENT OF STORM-WATER SEWAGE AT THE WORKS.

"A general rule ... special tanks ... or more should be provided at the works ... to be used simply for the purpose of receiving the excess of storm water which cannot be properly passed through the ordinary tanks. As to the amount which may be properly passed through the ordinary tanks, our experience ... that ... from three ... the rate of flow through the ... tanks may usually be increased to about three times ... "normal" dry-weather rate without serious disadvantage.

"The overflow at the works should be made from these special tanks and should be arranged ... that it will not come into operation until the tanks are full.

"Special filters which are only to ... storm are not usually ... and should not be provided.

"Any extra quantity of sewage arriving at the works in storms, which has to be filtered, should be treated on the ordinary filters, which should be made sufficiently large for the purpose.

"As regards the size of the standard ..., the amount of storm-water sewage to be filtered and the arrangements generally for dealing with the storm sewage at the outfall works, the Rivers Board, or the ... council in areas where no Rivers Board have been established, should have similar power to that which we have proposed in regard to overflows on branch sewers, and the local authority should have a similar right of appeal to the central authority.

"In ... practice ... to provide ... to deal with ... of the daily dry-weather flow, and it will not be necessary to provide ... more than ... the normal dry-weather flow.

"Under the ... storm sewage arriving at the outfall works would be ...

SEPARATE SYSTEMS OF DRAINAGE.

"In ... a local authority ... adopt the separate system of drainage for the whole or any part of their district, they should apply to the central authority, and that authority should be empowered ... such powers as are required.

"As regards the powers that are required, the ... separate sewers are provided, the local authority ... separate drains, but the local Acts to which our attention has been drawn do not modify the powers of the local authority under the general law in regard to by-laws as to the drainage of houses. Moreover, the powers of the local authority should not necessarily ...

"A ... drains should fall on the local authority, and there may be some instances in which it would be equitable that they should bear some portion of the additional ...

"The central authority should, therefore, have power to include in their Order such provisions for ... having regard to the local circumstances.

CONCLUSION.

"... duties of local authorities, and in view of the importance of not requiring a local authority to incur any further expenditure on sewage disposal than the circumstances of its area require we feel strongly ... local circumstances to be taken into account.

"We ... central authority should determine the nature of the tests which are to be applied for the purpose of standards, and that it should be made the duty of the Rivers Board, or of the county council in areas not under the jurisdiction of a Rivers Board, to determine from time to time, subject to appeal to the central authority, what standards should be adopted.

"In the ... it would be convenient that the central authority should prescribe one standard for all non-tidal waters in place of the existing statutory provisions. It would then rest with the Rivers Board or county council to fix, subject to appeal to the central authority, a higher or lower standard in any case in which they were of opinion that the circumstances required or justified a different standard.

"We ... that no action should ... to be brought in respect of damage alleged to be done by the discharge of an effluent which complies with the standard fixed for the water into which it is discharged, but that in such cases complaint should be made to the central authority, and, if a ... case is made out, that authority should ascertain whether the complaint is well founded, and should be empowered to fix a different standard if the circumstances are shown to require it.

"In cases where it is alleged that the effluent does not comply with the statutory standard, and that damage is caused by the discharge of such effluent, action should be brought in the ordinary courts.

"But any questions arising as to whether the effluent ... with the statutory standard, or as to whether ... damage has been caused by the discharge of the effluent in respect of which complaint is made, should be referred by the court to the central authority for determination. The costs of such determination should be borne by the parties to the action in such proportions as the court may determine.

Power should be conferred on the central authority to suspend from time to time the operation of

of supplying a large part of North Westmorland—an area comprising sixteen parishes—with water from one source, and last year a Local Government Board inquiry was held into a scheme for supplying the area from Blea Water Tarn, near Mardale, at an estimated cost of between £35,000 and £40,000. The council have now resolved that no further steps be taken in connection with the scheme until after the termination of the war. This decision is due to the greatly increased cost of materials and labour, and to the enhanced interest required upon borrowed money.

MISCELLANEOUS.

Middlesex C.C.—The wages of council roadmen receiving 36s. a week or less are to be increased by 2s. a week on their existing normal wage, the increase to date from March 1st last.

Paignton U.D.C.—The question of the repair of the sea wall at Preston has been under consideration owing to considerable damage which was recently sustained, and the council agreed that it would be preferable, instead of incurring the cost of the repairs, to proceed with the negotiations for the requisition of the beach, which was described as a possible valuable asset to the town.

Stoke-on-Trent T.C. — A committee has been appointed to consider the agreement with the Potteries Electric Traction Company for a renewal of the lease of the tramways.

BELGIUM TOWN PLANNING COMMITTEE.

Viscount Bryce, O.M., has consented to become president of the newly formed Belgium Town Planning Committee which has been constituted by the amalgamation of the various committees previously considering the question of the replanning of Belgium. The committee, which is under the patronage of the Belgian Government, has Mr. Raymond Unwin as chairman and Mr. Ewart G. Culpin as secretary.

Following upon the recent highly successful conference at the Guildhall, London, the next step will be the opening of a Belgian exhibition at University College, Gower-street, W.C. It is hoped that Lord Bryce will open the exhibition on April 6th, and it will remain open until the end of the month.

At the same time study circles of architects, lawyers, and others will be instituted for the consideration of the actual facts of town planning, but on the legal and technical sides; lectures and conferences will be held for municipal councillors and the general body of the public in order to educate them in these matters. University College has kindly provided studio and office accommodation.

Money is urgently needed to carry on the work, and may be addressed to the secretary at the School of Architecture, University College.

FOR OTHER ADVERTISEMENTS
See End of Paper.

URBAN DISTRICT COUNCIL OF HORNCASTLE.

ROAD MATERIAL.

The above Council invite Tenders for Supplying the following Road Material, viz.:—

390 tons (more or less) of X Granite.
270 tons (more or less) of XX Granite.
200 tons (more or less) of 2½-in. Slag.
80 tons (more or less) of ½-in. Clean Slag Chips.
20 tons (more or less) of Slag Dust.

To be delivered at Horncastle Station as and when required by the Council's Surveyor (the Contracts to be completed by 30th September next, and security for the due performance thereof must be given).

Small Samples to be sent to the Surveyor, Mr. F. Weeber, Foundry-street, Horncastle.

Forms of Tender can be obtained from the undersigned.

The Council do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, marked "Road Material," must be delivered to me not later than 2 p.m. on Monday, 19th April next.

(By order)
R. W. CLITHEROW,
Clerk to the Council.

Court House, Horncastle.
March 30, 1915. (2,519)

PERSONAL.

Mr. J. C. Trounson has been appointed deputy borough surveyor of Plymouth.

Mr. William J. Cook, surveyor to the Aylesbury Rural District Council, has resigned.

Mr. T. Ingle, Colne, has been appointed highway surveyor to the Louth Rural District Council.

Mr. J. Pickup has been appointed building inspector to the Burnley Corporation in succession to Mr. T. Cross, deceased.

Mr. W. H. G. Browne, surveyor and inspector to the Bolsover Urban District Council, has been appointed supervising sanitary inspector at British Guiana.

Mr. J. G. Howard, assistant surveyor to the Berkhamsted Rural District Council, has been appointed surveyor and inspector to the Salcombe Urban District Council.

Mr. J. R. Hadfield, surveyor to the Berkhamsted Urban District Council, has received the congratulations of his council upon obtaining the diploma as an associate member of the Institution of Civil Engineers.

Mr. George D. Macniven, L.R.I.B.A., of the firm of Messrs. Greig, Fairbairn & Macniven, architects, has been appointed assistant architectural inspector to the Local Government Board for Scotland, under the Housing Acts, and more particularly in connection with the scheme for the housing of Admiralty employees at Rosyth.

Mr. F. W. Bricknell is recommended by the Works Committee of the Hull Corporation for the office of city engineer, in succession to Mr. A. E. White, who retired last year. Mr. Bricknell, who entered the service of the corporation thirty-eight years ago as a pupil, has since Mr. White retired acted as city engineer. The salary has been fixed at £750, with annual increases of £50, till the maximum is reached.

Mr. David M. Jenkins, Assoc.M.Inst.C.E., whose paper, "Notes on Extraordinary Traffic on Highways," read at last Saturday's district meeting of the Institution of Municipal and County Engineers at Cardiff, is reproduced elsewhere in this issue, was appointed borough engineer and surveyor of Neath in 1886, and subsequently water engineer and engineer to the corporation electrical undertaking. He has carried out many important works in the borough which he serves. He has acted as arbitrator in sewerage compensation cases and in boundary and other disputes, and has had considerable Parliamentary experience in connection with schemes promoted by his own and other authorities.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

EAST MIDLAND DISTRICT.

An East Midland District meeting is to be held at the Town Hall, Loughborough, on Saturday, April 10th.

PROGRAMME.

2.15 p.m.—The members and visitors will be received in the Council Chamber by the Mayor of Loughborough (Mr. W. W. Coltman, J.P.).

2.30 p.m.—To receive minutes of last meeting.
To elect district committee.
To discuss election of district representative, district chairman, and district secretary.
To consider any other general district business.

3 p.m.—Proceed in conveyances (at a charge of 1s. per person) to inspect the swimming baths, where members will be given the opportunity of inspecting an apparatus for teaching swimming, erected by Messrs. Herbert Morris, Limited, of Loughborough.
Proceed to sewage farm to inspect refuse destructor and other works.

5 p.m.—Arrive at town hall, where tea will be provided by the borough surveyor, Mr. A. H. Walker, Assoc.M.Inst.C.E.

E. H. Crump, Assoc.M.Inst.C.E.,
Hon. District Secretary

Hinckley.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. W. H. Matthews Jones, City Engineer and Surveyor, Chester.

NORTH-EASTERN AND EASTERN DISTRICTS.

A meeting of the North-Eastern and Eastern Districts of the institution will be held at Newark-on-Trent on Saturday, April 24th.

1.45 p.m.—Meet at the Saracen's Head Hotel, and proceed to the inspection of old castle ruins.

En route Ossington Coffee Palace, Trent Bridge and free library will be pointed out.

Parish church (exterior and interior). A short organ recital will be given by Mr. W. F. Wright, A.R.C.O., organist.

Old Magnus Buildings, with Tudor Hall, recently restored at a cost of £2,000 by Mr. H. W. Lockton, M.S.A. (member).

Various old buildings in Market-place.

Beaumond Cross.

New Magnus Grammar School (by the kindness of the Rev. H. Gorse, M.A., head master), designed by Mr. Lockton, and carried out at a cost of over £10,000.

5 p.m.—High tea at the Saracen's Head Hotel, at a cost of 2s. 6d. per head.

Short descriptive notes of the visits will be given by Mr. Lockton, and by Mr. P. A. Watford (member), surveyor, Claypole Rural District Council.

Members of the Yorkshire and other districts are invited to attend.

G. Bellson Cheeves,
Hon. District Secretary.

Oundle, Northants.

SOCIETY OF ENGINEERS.

At a meeting of the Society of Engineers to be held on Tuesday, April 13th, at the Institution of Electrical Engineers, Victoria Embankment, W.C., a paper, entitled "Main Roads, Past and Present, and Modern Methods of Construction and Maintenance," will be read by Mr. Frank Grove, M.I.M. and Co.E., assistant county surveyor of Surrey, the following being a synopsis:—

Brief history of roads from the time of the Romans to the present day—Traffic requirements immediately prior to the introduction of self-propelled vehicles—Details of road construction at that time—Effects of motor traffic on the old type of roads, and some methods employed to cope therewith—Description of a few of the modern methods of road construction and maintenance employed during recent years in the county of Surrey.

The chair will be taken at 7.30 p.m.

A. S. E. Ackermann,
Secretary.

17 Victoria-street, S.W.

Town Planning Institute.—We have received a copy of the first issue of the "Proceedings" of this institute. It relates to the first of three meetings held to discuss the Ruislip-Northwood town planning scheme. The reports of all meetings can be obtained from the secretary, Mr. A. R. Potter, 4 Arundel-street, W.C., price 1s. per copy.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

INSPECTOR OF NUISANCES.—April 3rd.—Twickenham Urban District Council. £140—£170 per annum.—Mr. H. J. Saunders, clerk.

ASSISTANT SURVEYOR AND INSPECTOR.—April 6th.—Kingswood Urban District Council. 25s. per week.—The Clerk, Council Offices, Kingswood, Bristol.

TEMPORARY ENGINEERING ASSISTANT.—April 6th.—Wantage Rural District Council. £2 12s. 6d. per week.—Mr. John W. Harris, engineer and surveyor, East Challow, Wantage, Berks.

SUPERINTENDENT OF HIGHWAYS.—April 8th.—Corporation of Huddersfield. £130 per annum.—Mr. K. F. Campbell, borough engineer and surveyor, 1 Peel-street, Huddersfield.

DRAUGHTSMAN.—For the Nigerian Government Railway. £300—£350 per annum.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

COST CLERK.—Sheffield Corporation.—General Manager, Water Department, Town Hall.

CLERK OF WORKS.—Ivybridge Urban District Council. £3 3s. per week.—Mr. Harry Francis, engineer, 12 Lockyer-street, Plymouth.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

WHITEHAVEN.—April 21st.—Competitive designs for laying out the couch road site (6 acres 1 rood 25 poles) and the erection of houses, for the town council. Premiums, 30, 20 and 10 guineas.—Mr. T. Brown, town clerk.

GALEMIRE.—Designs for a small hospital, for the Galemire (Whitehaven) Joint Hospital Committee.—Mr. E. B. Croasdell, clerk, Union Hall, Whitehaven.

STEPNEY.—Designs for municipal buildings, for the borough council. Mr. H. T. Hare, F.R.I.B.A., has been appointed assessor.—Mr. G. W. Clarke, town clerk, 15 Great Alie-street, Whitechapel.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

ANGLESEY.—April 7th.—For the erection of new schools, for the Education Committee.—Mr. J. Owen, county architect, Menai Bridge.

TRURO.—April 8th.—For the erection of a clock turret in steel and concrete and other works, for the corporation.—Mr. F. A. Barnes, city engineer and surveyor.

WINDSOR.—April 8th.—For the erection of bathing boxes, for the corporation.—Borough Surveyor, Alma-road, Windsor.

TRURO.—April 8th.—For the erection of a clock turret in steel and concrete, and alterations to the council chamber, for the corporation.—Mr. F. A. Barnes, city engineer.

HYTHE.—April 9th.—For building a timber-framed and corrugated-iron isolation hospital for eight beds, for the corporation.—Mr. Chris. Jones, borough surveyor, Hythe, Kent.

CORNWALL.—April 10th.—For the erection of a school, for the Education Committee.—Mr. B. C. Andrew, architect, Biddicks-court, St. Austell.

TYRONE.—April 12th.—For additions to Dungannon House, and the erection of a pavilion and medical officer's residence, for the county council.—Mr. J. A. Hunter, Lisburn.

EASINGTON.—April 13th.—For the erection of fifty houses, and the construction of streets, for the rural district council.—Mr. G. Waterhouse, architect, Council Offices.

ASHINGTON.—April 17th.—For the erection of gasworks, for the urban district council.—Messrs. W. A. Valon & Son, Caxton House, Westminster, S.W.

CHERTSEY.—April 22nd.—For the erection of an additional engine-house, gas generating house, new workshop and coal store adjoining the present pumping station, Byfleet Village, together with engine-sheds and other buildings, for the rural district council.—Mr. Charles Muggleton, Byfleet-corner, West Byfleet.

TETBURY.—April 23rd.—For sinking a borehole, for the urban district council.—Mr. H. J. Weaver, consulting engineer, Northgate Mansions, Gloucester.

sec. 98 of the Thames Conservancy Act, 1899, and sec. 7 of the Middlesex County Council Act, 1906. In the Mersey and Irwell Joint Committee Act, 1892 (sec. 10), and the West Riding of Yorkshire Rivers Act, 1894, the power to take samples is limited to the point at which the effluent enters the stream. We think this limitation is undesirable.

STORM-WATER SEWAGE.

"We consider that the standards should not apply to storm-water sewage. In regard to this matter we refer to para. 292 to 295 of our Fifth Report," and we repeat our recommendations with regard to storm overflows and the treatment of storm sewage, the adoption of which would, in our opinion, prevent the occurrence of nuisance.

TIDAL WATERS.

"In Part VII. of our Fifth Report we summarised the position in regard to the pollution of estuaries and tidal waters (which we dealt with at length in our Fourth Report), and stated that we did not think it practicable to lay down fixed rules as regards a standard of effluent for tidal waters.

"We do not now suggest that the general standard should apply automatically to tidal waters as in the case of non-tidal waters, but we think that the principle which we have recommended in regard to special standards for streams might usefully be applied to tidal waters where a standard is considered necessary."

NINTH REPORT

Our Ninth Report dealt (i.) with the discharge of manufacturing wastes which for any reason could not be taken into sewers, and (ii.) with the disposal of domestic refuse in rural areas. In the first part we gave a detailed account of most of the chief trade processes by which waste liquids were produced, of the character of those liquids, and of the means which had been or could be adopted for purifying them. This account embodied the result of our own observations at a number of works which were selected on the advice of rivers and county authorities as being fairly representative of the various trade processes and as including the best examples of purification plant; it also contained the results of experiments which we had instituted in regard to certain trade liquids, the purification of which was especially difficult. We also utilised information placed at our disposal both by manufacturers and by officials of the West Riding of Yorkshire Rivers Board and the Mersey and Irwell, and Ribble Joint Committees.

We found that efficient means of purification were available in the case of some, but not all trade liquids. Many wastes, the impurities of which were mainly in solution, could be considerably improved by clarification, but could not, in the present state of knowledge, be thoroughly purified.

Hence the requirement of the existing law that trade wastes should (subject to certain exceptions) be rendered "harmless" was in many cases impracticable, and the authorities charged with the duty of administering the law had to exercise their own discretion in regard to the degree of purification to be demanded of manufacturers. We considered therefore that, as in the case of sewage effluents, there should be prescribed for trade effluents a standard of purity which should at once be a guide to the administrative authorities and a security to the manufacturers in regard to the extent of their obligations.

We found further that, owing to the wide differences in the character of the various trade wastes, both as regards their effect upon streams and as regards the difficulty and expense of treating them, it would be necessary to consider each kind of trade waste separately, with a view to suggesting an appropriate standard. We gave reasons for thinking that it was not desirable or necessary to prescribe a graduated system of standards (as we proposed in the case of sewage effluents), but that a single standard for each trade would suffice, provision being made for raising or lowering the standard where shown to be necessary in exceptional cases.

For the purpose of suggesting standards for the different trade wastes, we found it convenient to classify the wastes as follows:

"(A) Those for which efficient purification is practicable.

"(B) Those for which efficient purification is not in the present state of knowledge practicable.

"In Class A we include waste liquors resulting from:—

(i.) Coal washing.
Tin mining.
Lead and zinc mining.
China-clay works.
Stone quarrying.
Stone polishing.
Wood pulp paper works.
} In all these cases adequate reduction of solids in suspension may be regarded as efficient purification.

(ii.) Brewing.
Malting.
Distilling.
Tin plating.
Galvanising.
Wire drawing.
Shale oil distillation.
Woolscouring.
Tanning.
Leather dressing.
Fellmongering.
Dairying.
} In these cases dissolved impurities should also be removed.

"In Class B we include waste liquors resulting from:—

(i.) Bleaching.
Waste bleaching.
Paper work (except where paper is made from wood pulp only).
Cotton dyeing.
Cotton printing.
Woollen dyeing.
Woollen piece and yarn scouring with dye liquor.

(ii.) Sulphite cellulose manufacture.
Gas and coke production.

Although no practicable means are known for rendering completely harmless the liquids included in this class, nearly all of them can be and are considerably improved by clarification.

"We have placed sulphite cellulose paper and gas liquor in a separate subdivision because we are not aware of any method of so treating them that the effluents could properly be discharged direct into streams."

As regards the standard to be prescribed, we stated as follows:

"We think it impossible to lay down, as regard each trade, such a standard as would ensure the complete purification of rivers, since, in the present state of knowledge, the attainment of such a standard would in many cases be financially impracticable, and therefore useless. We have thought it useful, however, to suggest limits of impurity which we believe to be now practicable, and which are based upon careful consideration of the data given in the detailed sections.

"These figures will afford guidance to the central authority when established, and, although provisional and based upon the present condition of knowledge, they should, in our opinion, if prescribed, remain in force for a definite period. At the end of this period they would be subject to revision, since admittedly they are inadequate to prevent pollution of streams, and improved methods of treatment may meanwhile have been discovered.

"In regard to the period for which standards for sewage effluents should remain in force we made the following suggestion in our Eighth Report:

> "52. We think it of importance that a standard once imposed upon a local authority should not be altered until the expiration of a definite period in order that they may have some security as to the extent of their liability.
>
> We suggest that these periods should be prescribed by order of the central authority, and should in the case of the general or any specially stringent standard be not less than ten years from the date when the standards came into

[*] Summarised under heading of Fifth Report.—Ed. THE SURVEYOR.

operation. In the case of [illegible] standard the period should be [illegible]. The [illegible] the latter requires [illegible] a standard the [illegible] there may be difficulty in reducing the period during which the standard should be in force, and, on the other hand, it is [illegible] other [illegible] to the Board of Trade periodically [illegible] to the Board's consent to any particular [illegible] and the [illegible] of those periods. [illegible] experience to be gained [illegible] general standard required any modification (which we suggest [illegible] by the issue of an order), and also to revise, where necessary, the special standards in particular cases.

"We think the [illegible] applied to standards for trade effluents—viz., that in the case of those [illegible] expensive plant is prescribed the period might be longer than in those where only partial means of purification are as yet known. In the latter case the period could, of course, be extended if in the meantime no improved [illegible] discovered.

CLASS A.

"[illegible] we have pointed out above, notwithstanding the [illegible] in suspension may be regarded as [illegible] and the [illegible]

COAL WASHING.

"We think that the effluent should not contain more than 4 parts of suspended solids per 100,000. In a number of cases this standard might have to be relaxed.

TIN, LEAD AND TIN SLAG, CHINA CLAY WORK, STONE QUARRIES, AND STONE POLISHING WORKS.

"Here we assume practically a standard of 6 parts suspended solids per 100,000. In general evidence shows, reduction of suspended solids to this [illegible] by lead, tin, antimony, or arsenic.

"There are, however, cases in which [illegible] other than those of the particular industry are affected by the discharge of the waste waters. If it can be shown, as in the case of [illegible] to the sea which are not used for fishing, for navigation [illegible] or manufacturing purposes [illegible] waste waters without treatment, we think that the standard might be relaxed or wholly dispensed with.

PAPER MILL WHERE WOOD PULP ALONE IS USED.

"In this case the effluent should not contain more than 4 parts of suspended solids per 100,000.

CLASS A (a).

"In these cases such reduction of [illegible] as well as suspended impurities is necessary.

BREWERIES AND MALTINGS.

"We suggest that the effluents should contain not more than 4 parts per 100,000 suspended solids, and should take up not more than 4 parts per 100,000 dissolved oxygen in five days.

DISTILLERIES.

"For the various methods of treating this waste we refer to our Sixth Report. Since the issue of that report we have kept under observation plants which were erected on the lines which we recommended, and have found them both efficient and economically practicable. We recommend a standard of 3 parts suspended solids and 2 parts dissolved oxygen absorption in five days. (This corresponds with the general standard which we have suggested for sewage effluents.)

TIN PLATING, GALVANISING AND WIRE DRAWING.

"These wastes are strongly acid from mineral acid, and contain much iron in solution. The stronger liquids should not in any circumstances be allowed to discharge into streams. The wash waters should be neutralised and settled.

"We suggest that the standard for these wash waters should be 6 parts per 100,000 suspended solids.

"Even after compliance with this standard, a somewhat yellow and colloidal liquid might result. It might possibly have to be softened before discharge, but we do not think it necessary at present to suggest any standard of hardness.

WOOL DISTILLATION.

"[illegible] such we suggest the 4 parts per 100,000 suspended solids, and 4 parts per 100,000 dissolved oxygen [illegible]

WOOL-SCOURING LIQUOR.

"The [illegible] precipitation liquor, obtained by subjecting wool-scouring liquor to direct precipitation, is practically free from fat, it remains very strongly organic, and may be regarded as similar to a highly concentrated sewage liquor; and the same may be said of the septic tank liquor from wool suds, which also contains much sulphuretted hydrogen.

"For this reason we consider that the liquor should be looked upon as a sewage and purified biologically. This treatment has so far only been carried out in the laboratory, but we are of opinion that it is practicable at a reasonable cost, and, subject to our conclusion being verified by experiments on a large [illegible] a standard of 4 parts suspended solids and 4 parts dissolved oxygen absorption in five days.

"Pending such experiments we would suggest for this type of precipitation liquor clarification down to 6 parts of suspended solids per 100,000.

CURRIED CATTLE LEATHER DRESSERS' WASTE AND [illegible] WASTE.

"These wastes are also highly polluting, and contain much organic matter of animal origin in solution. Our observations in regard to the treatment of wool suds are equally applicable to these wastes, and we make a similar suggestion in regard to a standard—viz., 4 parts suspended solids and 4 parts dissolved [illegible] five days.

BARLEY WASTE.

Here [illegible] are applicable. We suggest as a standard 4 parts suspended solids and 4 parts dissolved oxygen absorption in five days.

CLASS B.

"We [illegible] that [illegible] trade waste in regard to which we are not in a position to say that efficient means of purification (such as would render them 'harmless') are reasonably practicable and available. As we have said, however, some of them [illegible] are necessary to present knowledge, capable of being considerably improved, and it will be useful to indicate to what extent improvement has been found to be practicable.

CLASS B (a).

BLEACHING.

"In this case the polluting matter is mainly in solution, but some improvement would be effected by reduction of suspended solids. We suggest that it should not show more than 6 parts suspended solids.

"Systematic experiments on a large scale would be necessary before suggesting any standard based on the absorption of oxygen.

WASTE BLEACHING.

"The waste liquor from this trade is of the same nature as that from bleaching, but it may contain a good deal of soap in addition. We suggest a standard of 6 parts suspended solids per 100,000. Systematic experiments on a large scale are also required here.

PAPER WORK (STRAW) AND RAG PAPER (RAG AND WOOD PULP PAPER).

"The liquid portion of most of these wastes is, as a rule, considerably weaker than that of bleach wastes, but we have found one instance where it was equally strong (owing, probably, to a less abundant water supply).

"Here, too, systematic experiments on a large scale are necessary. In the meantime we can only suggest a standard similar to that proposed for bleach wastes—viz., 6 parts suspended solids.

PAPER WORKS (BROWN PAPER AND WALL PAPER).

"For the waste liquors from these works we think that a standard of 6 parts of suspended matter would suffice at the present time.

COTTON DYEING AND COTTON PRINTING.

"Compared with many other wastes these are not very polluting, but their volume is large. Although most of their oxygen-absorbing power is due to dis-

solved impurities, considerable improvement is effected by clarification.

"We suggest as standards 4 parts suspended solids for cotton-dye liquor, and 6 parts for the liquor from print works.

WOOLLEN DYEING, FELT AND YARN SCOURING AND FLANNEL-SCOURING LIQUORS OCCURRING EITHER SEPARATELY OR IN ANY COMBINATION.

"Though these wastes are not usually concentrated, their liquid portions are, as a rule, of an oxygen-absorbing and putrescent nature. Clarification produces considerable improvement. As a standard we suggest 4 parts suspended solids per 100,000.

WOOL SCOURING, WITH FELT AND YARN SCOURING AND DYE LIQUORS.

"Wool-scouring liquor or wool suds, when unmixed with other wastes, forms the subject of a later paragraph. It is an exceedingly polluting liquid, and when it is combined with those discussed in the preceding paragraph it adds considerably to their strength.

"If, however, all four liquors, as produced together at the works, are carefully mixed, it is possible to obtain, with the aid of good precipitation, a non-putrescible effluent which does not take up oxygen at an excessive rate.

"The standard which we suggest is 4 parts suspended solids.

Class B (ii.).

MANUFACTURE OF SULPHITE CELLULOSE.

"So far as we are aware, there are only two works in this country from which either the waste liquid produced by this process or the more dilute washings are discharged into a stream. We are unable to suggest a standard appropriate to the waste liquid, but we think that neither the liquor itself nor the first washings should be discharged into a stream.

GAS LIQUOR.

"Here, too, we are unable to suggest a limit of purification. In no circumstances should the liquor be discharged untreated into a stream. In some cases purification by percolation through 'bings' may be sufficient to permit the discharge of an effluent, but we can make no general pronouncement on the point. Where no bings exist biological treatment on the lines suggested by Dr. Fowler will lessen very materially the polluting power of the liquor. Evaporation appears to be the only other practicable alternative at the present time."

"The information which we have set out above is obviously incomplete. It does not extend even to all existing trade processes whereby polluting liquids are produced, though it includes the most important, and it is to be anticipated that new processes will continually be coming into operation and creating a demand for new means of purification—a demand which could not be efficiently forestalled by any system of standards which we could suggest.

"We do not, therefore, recommend that the central authority should forthwith proceed to prescribe a complete set of standards for all known kinds of trade waste, but we think it eminently desirable that a general standard should be prescribed in all cases where its efficacy and practicability have been in some measure tested by experience. We are confirmed in our view inasmuch as the West Riding of Yorkshire Rivers Board, the Mersey and Irwell and the Ribble Joint Committees, and the Thames Conservancy Board have progressively employed for their own guidance working rules which are in the nature of standards. It will, however, be necessary to consider the prevention of pollution both by existing and by new processes for which no standard can as yet be fixed.

"In the case of some trade wastes additional standards may have to be imposed—*e.g.*, standards of hardness and of 'caustic' alkalinity or acidity, or a requirement of neutrality, for the effluents from various branches of the cotton, woollen and paper trades and from metal works; a standard for arsenic or other poisonous metal for trade effluents from substances are used or mined; an oil-film standard for the wastes from oil, gas, grease or soap works, &c. Some further investigation may be required before such standards—or some of them—can properly be laid down.

"These standards should, in our opinion, be looked upon for the most part as *general* standards, applicable only to certain rivers or reaches of rivers where local circumstances call for them. It is important, however, that the necessity for imposing them in special cases should be borne in mind when the *general* standard is being considered, for in some cases the special standard may be required more urgently than the general standard. Several manufacturers have, for instance, urged that the 'softness' of a river water is of greater moment to them than its organic purity. It will be necessary also to have special regard to the protection of drinking waters against mineral poisons."

In regard to the alterations of the law which would be necessary to give effect to our proposals, we made the following recommendations:

ALTERATION OF EXISTING LAW.

"We may now set out in greater detail the proposed amendments of the existing law which have been foreshadowed in the earlier sections of this report. We recommend that the law should be altered so as to provide as follows:—

"(1) The central authority may by order prescribe a general standard for effluents produced by any trade process therein defined, the standard to remain in force for a period to be specified in the order. The order shall be published in the *London Gazette*, and a copy of it shall be sent to every rivers board, county council and sanitary authority.*

"(2) Where a general standard has been thus prescribed, the authority, before taking proceedings, shall serve a notice on the manufacturer specifying the requirements of the general standard and the period within which the requirements are to be complied with. After the expiration of that period, proceedings may be taken against him for non-compliance with the notice (but on no other ground†), and the consent of the central authority shall not be required to such proceedings. The proceedings should not be taken in a county court for an order, but in a court of summary jurisdiction for a penalty. The court may extend the period in which the requirements are to be complied with, and if they consider that it is doubtful whether the notice can reasonably be complied with, they shall remit the question to the central authority, who shall confirm or modify or cancel the requirements, and who may fix a period during which the requirements as confirmed or modified shall be in force or shall be cancelled, as the case may be. The central authority may from time to time extend such period, but on the expiration of the period the requirements of the general standard shall be deemed to be again in force in regard to the works in question.

"(3) Where no general standard has been prescribed the authority, before taking proceedings, shall serve a notice on the manufacturer specifying the degree of purification which they propose to require, certifying that means are available for meeting their requirements, and prescribing the period within which their requirements are to be met. Within one month of the service of the notice the manufacturer may appeal to the central authority against the notice. If he does not appeal, proceedings may be taken against him after the expiration of the prescribed period as if the requirements of the notice were a general standard in force in regard to his works.

"If he appeals, the central authority shall confirm or modify or cancel the requirements of the sanitary authority. If the central authority confirm or modify the requirements, such requirements as confirmed or modified shall be deemed to be the standard in force in regard to the works of that manufacturer for such period as the central authority shall specify. The central authority may also extend the period within which the requirements must be complied with, and on the expiration of such period as prescribed or extended proceedings may be taken without the consent of the central authority for the recovery of a penalty for non-compliance with the standard in force. If the central authority cancel the requirements of a notice, no proceedings shall be taken within that period.

"(4) Where a general standard has been prescribed, but for any reason the authority propose to require of any manufacturer a higher degree of purification than is required by the standard, the authority shall also set out in the notice the requirements of the general standard and the reasons for requiring the higher degree of purification. In all other respects

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*This expression includes Rivers Boards, county councils, and joint committees of county councils.

†*I.e.*, not on the ground that he is discharging a "poisonous, noxious, or polluting liquid," but only on the ground that his effluent infringes the particular standard.

the procedure shall be as if no general standard were in force.

"(5) The authority shall be required to prepare an annual report on the administration of the Rivers Pollution Prevention Acts within their area, including particulars of all requirements made by them under the Act, whether appealed against or not, and to submit a copy thereof to the central authority.

"(6) Where a Rivers Board is constituted for any area, the authority for the purpose of enforcing the Rivers Pollution Prevention Acts in that area shall be the Rivers Board. The order constituting the Rivers Board shall provide for the adequate representation on the Rivers Board of any fishing interests concerned.

"(7) Where no Rivers Board has been constituted for the purpose of enforcing the Rivers Pollution Prevention Acts, the county council, the council of a county Borough, or the central authority may, by Provisional Order, confer on or impose upon the Rivers Committee any powers or duties of a Rivers Board, including the co-optation of representatives of any fishing interests for the said purposes.

NEW SOURCES OF POLLUTION.

Representations have been made to us that the law should be altered with a view to the prevention or regulation of the establishment of new sources of pollution. It has been suggested that every person who proposes to set up works whereby liquid refuse might be discharged into a stream should be required to give notice of his intention to the sanitary authority or Rivers Board specifying what steps he proposes to take to prevent such liquid refuse from polluting the stream; that the sanitary authority or Rivers Board should have power to report to the central authority to disapprove the proposals; and that any person failing to give notice or commencing to discharge liquid refuse after his proposals have been disapproved should incur a penalty.

"We are fully in sympathy with the object of taking measures to prevent the pollution, but we think that the suggested procedure might involve needless interference with manufacturers. We do not, therefore, recommend that the law should be altered except to this extent—that the manufacturer proposing to establish new works from which liquid refuse would be discharged into a stream should be required under penalty to give to the Rivers Board as long notice as possible, and at least a month's notice, before commencing to discharge. The Rivers Board would then indicate to him the degree of purification which would probably be required of him.

"We do not think that a penalty other than for failure to give notice or to obtain approval of a proposal should be imposed.

POWER OF ENTRY.

"We regard the present [illegible] as a great improvement on the English Rivers Act, which we think should extend to entry on the purification works of manufacturers.

(59) We think that the officers of the central authority and of the Rivers Boards should have statutory authority to enter upon lands at any time without notice for the purpose of inspecting works and taking samples of the liquor or effluent and river water wherever they can be obtained. The Rivers Pollution Prevention Act, 1876, contains no provision on this subject, but reference may be made to secs. 16 and 17 of the Alkali Works Regulation Act 1881, sec. 98 of the Thames Conservancy Act 1894, and sec. 7 of the Middlesex County Council Act, 1906. In the Mersey and Irwell Joint Committee Act 1892 (sec. 10) and the West Riding of Yorkshire Rivers Act, 1894, the power to take samples is limited to the point at which the effluent enters the stream. We think this limitation is undesirable.

"We recommend further that manufacturers should be required under penalty to provide facilities for taking samples of effluent at the point or points where it leaves their premises.

MINE WATER.

"We have already referred to the exemption which is conferred by the Rivers Pollution Prevention Act, 1876, in regard to waters proceeding from any mine 'in the same condition as that in which it has been drained or raised from such mine.' We are not aware of the circumstances in which this exemption was [illegible] We have received some evidence of the pollution caused by some mine waters of this character, which in many cases continues after the mine has ceased to be worked. But our evidence is not sufficient to enable us to make any general recommendation in regard to preventing this form of pollution. Under the system which we have suggested it would be open to a sanitary authority to demand purification of such waters subject to appeal to the central authority, who would be able to consider each case on its merits."

In the second part we [illegible] on the disposal of solid and liquid [illegible] in rural areas.

[illegible] and describe [illegible] adopted in sparsely populated districts where, owing to distance, a public water supply and sewerage system is impracticable. We pointed out the risks of pollution and infection attendant on these methods, and indicated the means by which in our opinion these risks could be reduced to a minimum. The most important [illegible] these systems is to ensure the frequent and [illegible] removal of excreta from dwellings. The cesspools ought to be small and [illegible] We [illegible] that should be made to obtain the consent of the sanitary authority [illegible] Dr. Pearse strongly recommended the use of pails and the regular disposal of their contents in [illegible] existing in garden ground [illegible] being also disposed of on the land, the steaming being a simple method. This system, which he had instituted on his own property, he found both hygienic and profitable. We could not, however, follow him in recommending it [illegible] available.

We pointed out that there must always be a certain [illegible] which could not be dealt with by a dry-earth closet, but this [illegible] small no difficulty need arise, but where an ample water supply is available the volume [illegible] largely increased and a water-carriage system becomes inevitable. Cesspools might be utilised, but if they are [illegible] it would probably be [illegible] and [illegible] more than [illegible] they might endanger water supplies. A system of sewerage and sewage disposal should, in our [illegible] be [illegible] an abundant water supply.

We [illegible]

"In rural areas the main fact governing the question of the disposal of excremental matter and domestic waste waters is the abundance or the scarcity of the water supply.

"(1) With an abundant water supply, piped to the houses, water carriage is, in our opinion, the most satisfactory system. In most cases abundant water supply will involve a system of sewerage. Where there are isolated dwellings which it would be very costly to connect with the drainage system of the district the cesspool is a possible alternative where there is no danger of polluting water supplies.

"Under the Public Health Act local authorities have a discretion in regard to compelling connection with their sewers. We think it right that with their local knowledge they should have this discretion. The storage and disposal of excreta is a matter concerning a man's neighbour as well as himself.

"(2) Where a water carriage system is impossible because of the inadequate water supply we believe that under proper supervision a system of dry closets may be open to little objection on sanitary grounds provided the closet is so constructed that its contents can be conveniently and frequently removed, as by the use of pails.

"In small communities the removal may generally be left to the householder. In larger villages it may with advantage be undertaken by the local authority.

"The domestic waste water is best distributed over the gardens, or it may be conveyed to a cesspool as far as possible from the dwellings [illegible]

water supplies are prejudiced by the leakage from them.

"In villages where no sewers are available it is desirable that cottages should be provided with ample garden space for the disposal of domestic refuse.

"The use of dry earth in dry closets is of great importance, and local authorities should be given full power to secure its use.

"Local authorities should also circulate to householders elementary information as to the best method of dealing with refuse over their gardens."

BORROWING BY LOCAL AUTHORITIES.

ANOTHER LOCAL GOVERNMENT BOARD CIRCULAR.

The following circular, dated March 25th, has been addressed by the Local Government Board to local authorities in England and Wales:

In their circular letter of the 11th instant the Local Government Board referred to the decision of the Lords Commissioners of His Majesty's Treasury to restrict capital issues by local authorities within the narrowest limits. It was pointed out in the same circular letter that labour should be economised by local authorities as far as possible, and that the inception of new works, except such as are of pressing necessity, either for reasons of public health or on account of war requirements, should be avoided.

The board have been in communication with their lordships in regard to this matter, and it has now been arranged, in order to meet the convenience of local authorities and to avoid duplication of labour, that the sanction, approval or consent of the Local Government Board to any borrowing under powers conferred by public general Acts or by local Acts or Provisional Orders, under which such sanction, approval or consent is required, shall suffice, without any further approval by the Treasury, where

(a) the sanction, approval or consent has been given on a date subsequent to the 12th instant, and

(b) the money proposed to be raised is to be raised otherwise than by the issue of stock, bonds or bills.

Where a local authority hold a sanction, approval or consent of the board of an earlier date than the 12th instant which has not yet been acted upon, whether wholly or in part, no further action must be taken upon it without a further sanction from the board authorising the action, unless the money is to be raised by the issue of stock, bonds or bills, when the consent of the Treasury must be obtained instead of the further sanction of the board.

The Treasury have further decided that their approval will not henceforth be required for the renewal or replacement by local authorities of maturing mortgages.

With respect to the statement in the board's circular letter to which reference is made in the first paragraph above, that it has become necessary to avoid the inception of all new works except such as are of pressing necessity, either for reasons of public health or on account of war requirements, it must be understood that these terms will be construed in their strict sense.

Consequently, before any application is made to the board with a view to the immediate execution of works, local authorities should fully satisfy themselves that they can show that the expenditure cannot be avoided, postponed or reduced. Any application should be accompanied by a statement of the facts upon which the local authority rely in these respects.

The Treasury are anxious that the attention of local authorities should be particularly drawn to the fact that economies and restrictions on borrowing are possible not only as regards new works, but also as regards works in progress. As regards these latter, it will frequently be found possible by arrangement with contractors or otherwise to postpone works or parts of them, or to enlarge the period allowed under contract for their completion. In any case in which an application for sanction to this board or to the Treasury is necessary, where works are in progress or are the subject of a contract, it will be necessary to demonstrate that every possible effort has been made in this direction before the extent of the application has been finally determined upon.

TREASURY AND LONDON COUNTY COUNCIL.

In a letter to the London County Council, dated March 8th, the Treasury intimate that they are unable to approve of Clause 25 of the London County Council (Tramways and Improvements) Bill, which authorises the council to expend on capital account a sum not exceeding £271,900 for tramway purposes. The Treasury refer to their previous communication on the subject of certain applications for their approval of loans by the council to borough councils for the purpose of new capital expenditure, and observe that considerations similar to these apply to capital expenditure by the council itself. They trust that the council will agree with them that, as far as possible, all new capital expenditure should be postponed, and that unless special circumstances exist works in progress should be slowed down. In the event of the council preferring to proceed with the Bill, the Treasury ask that an undertaking should be given that none of the schemes will be commenced or any expenditure incurred in connection with them without the previous sanction of the board.

Another letter [illegible] that the Treasury [illegible] no further objection to the granting of the following loans by the county council:

Battersea Metropolitan Borough Council, £3,000 for electricity mains.

Hammersmith Metropolitan Borough Council, £10,000 for electricity undertaking.

Lambeth Metropolitan Borough Council, £[illegible] for paving work.

North Surrey District School Managers, £1,124 for Anerley school.

Lambeth Metropolitan Borough Council, £1,013 for paving works.

Lambeth Guardians, £[illegible] for work at Brooke-road infirmary.

In sanctioning the above loans the Treasury have been mainly influenced by the consideration that the expenditure has already been incurred practically as a whole, while in the case of Battersea the expenditure is justified as being for the furtherance of the war. "But," it is added, "it should be intimated to the borough councils that the Treasury will not be able to approve any loans by the London County Council for new expenditure which is not necessary for the furtherance of the war, whether or not all the sanctions, departmental or Parliamentary, normally required have already been obtained, and that approval will not be given for the borrowing of sums already spent unless the council are able to satisfy this department that every effort is being made to restrict expenditure upon works already in progress as well as upon new works."

Dealing with the action of the Hackney Borough Council in obtaining from their bankers the sum of £10,000, which the department had declined to allow them to borrow from the London County Council, the Treasury say that, while they are not prepared to require that their approval should be obtained in all circumstances before sums are borrowed by borough councils from their bankers, they desire it to be understood that, if a council insists upon incurring capital expenditure against the wishes of the department—which, they point out, is acting with a view to the general interests of the nation in existing circumstances—sanction will not be given by the Treasury or the Local Government Board in the case of any further application for approval to borrowing for any purpose whatever.

Regard being had to the fact that the borough council of Stoke Newington have already spent the sum of £4,000 in connection with their electricity undertaking which they now desire to borrow from the London County Council, Treasury approval would not be withheld from the proposed loan provided that the borough council will undertake not to incur further capital expenditure of any kind in existing circumstances which is not really necessary in the national interest.

Recruits Wanted for London Sanitary Company.—The 1st London (City of London) Sanitary Company, R.A.M.C. (T.), are asking for more recruits for Imperial Service. Men of nineteen to thirty-five who are sanitary (or assistant) inspectors, or who possess a good knowledge of sanitation, men in public health departments of borough, urban or rural authorities, surveyors, engineers, carpenters and plumbers are specially required. There is a very good prospect of going abroad [illegible] being continually sent overseas. Applications for enlistment should be addressed to O.C. 1st London Sanitary Company, Duke of York's Headquarters, Room B. 6, Chelsea, S.W.

The Surveyor
And Municipal and County Engineer

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[illegible] would prove a great [illegible] under the [illegible] ation.

The speed of rotation is generally to the engineer's hand of 500 revolutions per minute, although this can be increased to suit the conditions under which the pump has to work.

Careful attention has been shown in the design to make a pump having long life. For instance, the bearings of the larger sizes are all white metal lined and of ample area. The load per square inch of bearing area in no case exceeds 80 lb. per square inch. Another important item of design is positive speed for with pumps dealing with thick substances this has to be kept low. The pump at the Stanford Road sewage pump is below 100 ft. per minute.

The lubrication of the internal wearing parts is effected by the liquid the pump is handling with the addition of grease which is supplied to the bearings

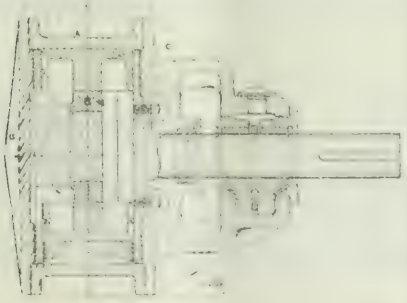


FIG. 2.

by Stauffer grease cups. The cutting up action previously referred to is effected by the cylinders passing the lower shoe, and effectively shearing any obstruction which may protrude such as rags, paper or sticks.

The whole pump can be very easily examined at any time by the removal of one end cover, and without disturbing any pipe joints. The rotor can be withdrawn from the pump without any unbolting of the pump from its bed, or without touching the motor which drives it. On a long suction lift the pump answers admirably on account of its high vacuum-forming propensities. On a closed suction a vacuum of within ·25 of the barometer can easily be maintained.

The Rotoplunge pump can be used to handle air entirely as a vacuum pump or as a compressor. For the drainage of cesspools and other work it is admirably adapted.

The introduction of this pump will undoubtedly solve a great many of the troubles of sewage work, and we refer anyone interested to the makers, The New Rotoplunge Pump Company, Limited, 24 Broadway, Westminster, S.W.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

I [illegible] all road authorities throughout the United Kingdom will do all they can to help the military authorities by keeping their roads in repair without calling upon the war [illegible] for [illegible] resolutions. Why did [illegible] to certain of the [illegible] should they not remember that those of us who cannot actively fight for their country may do so by giving [illegible]

* * * *

[illegible] war even more than other professions? Will not the partial suspension of municipal and other works [illegible] reduction of their staffs with resulting distress? Is there not likely to be far more suffering imposed on [illegible] Do we realise the [illegible] that this war is likely to bring if it is unduly prolonged by the selfish actions of those who by their [illegible]

* * * *

[illegible] made to prove almost anything? Is not this exemplified [illegible] Council of the Royal Automobile Club on the 24th [illegible] 1914 published in the Times of [illegible] by "figures" that self-propelled traffic is, after all, [illegible]

* * * *

Does [illegible] at popular opinion? May it therefore be considered that the following paragraph in the issue of the 24th [illegible] prophetic?—

> [illegible] Council as to the retirement on [illegible] the London County Council has been appointed [illegible] to advise the council on [illegible] matters. The [illegible] system will be pressed now [illegible] point of view.

There is a proverb which says: "There is many a [illegible]

* * * *

Why [illegible] replace them with women? Why cannot England, in this respect, copy other countries, who realise that [illegible] employed than in doing work which can be equally well done by women. Are there [illegible] ployed in this work at the present time? And will not the call to [illegible] citizen in this country makes up his mind to do his best to stop it by rendering all the assistance of which he is capable?

The War and Salaries. The Establishment Committee of the London County Council have, in view of the exceptional circumstances obtaining owing to the war, decided not to submit any recommendations to the council with regard to the annual revision of salaries, and have been informed that the staff generally agree to this course. Other committees have taken similar action as regards certain of the staff for which they are responsible. "We think," observe the General Purposes Committee in a report submitted last Tuesday, "that the council will learn with satisfaction of the spirit in which the staff as a whole have concurred in the course taken and have performed the additional duties occasioned by the absence on war service of many of their colleagues without expectation of additional remuneration."

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, assoc.m.inst.c.e.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

The premium for March is divided between

Mr. B. Knight,
Town Hall,
Newport, Mon.,

and

Mr. M. T. Roberts,
Cartref,
Grange-road,
Rhyl,

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

463. Bomb-proof Dug-out.—Give sketches of a bomb-proof dug-out to hold five people. (Tico.)

466. Road Making.—Describe a few simple tests that will enable an engineer to ascertain the quality of the bitumen and filler to be used in a bituminous macadam road. (Eneer.)

469. Sewage Sprinklers.—Give a good practical method of marking off the holes in the distributing arms of revolving sprinklers. The diameter of holes to be constant. (C. A. B., *Catford.*)

470. Structures.—What are "deficient" and "redundant" frames respectively? Give some outline diagrams as illustrations. (T. R.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

467. Destructors—Forced Draught.—Discuss the relative advantages of steam jet blowers and fans for producing forced blast in destructors. (Eneer.)

The use of steam as a means of obtaining a draught is advocated by some designers on the ground that the clinker does not adhere to the bars so firmly as when the blast is from a fan, and that the decomposition of the steam prevents the wearing away of the bars. The efficiency is not so good as compared with the fan. It it difficult to estimate the quantity of steam required to obtain a given draught, but it has been stated that it is five times the amount that would be used to obtain the same draught by means of a fan. It will be seen that it is more economical to use the steam for driving a fan than for direct blast; however, where there is little demand for the steam it may well be used without a fan. The amount of power used to create the air pressure for a forced draught, whether fan or steam jet, is obtained from the heat generated, and therefore it must be deducted from the amount of heat left for power purposes. ("T. Square.")

468. Girder Design.—Explain a method for determining the position of the web stiffeners in a plate girder. (J. F., *Padiham.*)

There is a considerable difference of opinion as to what is the precise function of web stiffeners in plate girders, some authorities believing that the use of stiffeners increases the torsional rigidity of the girder, thus obviating any side twisting, while others hold that they are necessary in order to prevent buckling due to shear. Should the former theory be adhered to, empirical rules only are available, and are, approximately, as follows: The stiffeners should be placed at distances of from 2 ft. 6 in. to 3 ft. apart, at and near the abutments, the pitch increasing to not more than 4 ft. at the centre, where the common practice is to use alternate tie and plate stiffeners As regards the latter theory, far more exact calculations are possible, the method being as follows: It is known that the shear forces acting upon the web can be regarded as being equivalent to tensional and compressional forces acting at an angle of 45 deg. with the horizontal. The compressional forces are those from which the required pitch is calculated. Rankine's theory of web stiffeners treats a strip of the web inclined at an angle of 45 deg. with the horizontal as a column, and if L be the distance between the angle-irons fastening the web to the flanges, then length of column = L cosec 45°. Both ends are assumed to be fixed, and the thickness of the column is obviously equal to the thickness of the web. Unit width is assumed. If now we test the column by means of the formula given below, and it is found that the intensity of compressive stress as obtained from the equation comes within the safe limit for the material, then theoretically no stiffeners are necessary. This, however, is seldom the case; so we then proceed to find what length of column will ensure a safe intensity of compressive stress.

The load on the column is usually assumed to be equal to the shear per foot-run of depth, and its width as 1 ft. Gordon's rationalised column formula is the most convenient to use, and from it, as we see below, can be obtained the length of column (measured on a line between the edges of the stiffeners at an angle of 45 deg. with the horizontal), which will not buckle under the given load.

We commence at one of the abutments, where the shear is a maximum. Then we have—

$$w = \text{load on column} = \frac{\text{shear at abutment}}{\text{depth of web}}$$

and the formula referred to is—

$$w = \frac{f_c \, A}{1 + a\left(\frac{l}{d}\right)^2}, \text{ where}$$

w = load on column
f_c = safe intensity of compressive stress for material
A = cross-sectional area of column
l = length of column
d = least dimension of column
a = a constant, varying with the section, the material and the method of end-fastening.

In this case, both ends being fixed, $a = \frac{1}{1200}$ for steel, and $\frac{1}{900}$ for wrought-iron. Hence we can obtain l, which, reduced to horizontal distance $= l \cos 45 = \frac{l}{\sqrt{2}}$. Thus we have the position of the first stiffener. Consider a numerical example. Find the necessary pitch of stiffeners in a steel-plate girder, in which the shear varies from 100 tons at the abutments to zero at the centre, the depth of web being 5 ft., and thickness being $\frac{1}{2}$ in. Then we have—

w = load on column $= \frac{100}{5} = 20$ tons

Column is 1 ft. wide

$\therefore$ Cross-sectional area $= 12 \times \frac{1}{2} = 6$ sq. in.

Also for steel, $f_c = 6\frac{1}{2}$ tons per sq. in.

least dimension $= \frac{1}{2}$ in., and $a = \frac{1}{1200}$

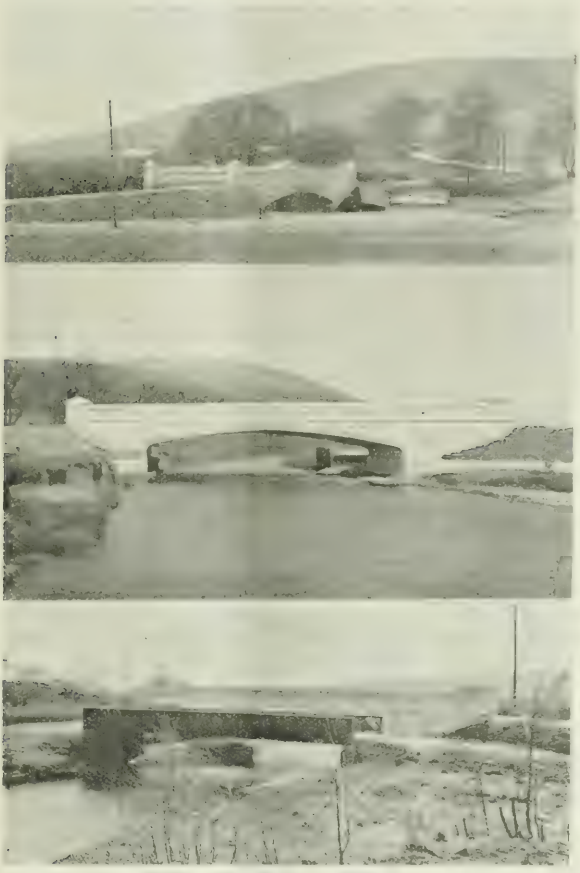
$$\therefore 20 = \frac{6\frac{1}{2} \times 6}{1 + \frac{1}{1200}\left(\frac{l}{\frac{1}{2}}\right)^2} \quad \therefore l = 16{\cdot}88 \text{ in.}$$

$\therefore$ Horizontal distance between stiffeners at abutments

$= \frac{16{\cdot}88}{1{\cdot}414} = 11{\cdot}94$ in., or approximately 1 ft.

Since the shear decreases as the distance from the abutment increases, it is not necessary to have so small a pitch for the stiffeners across the entire span, and we therefore proceed, as above, to find the position of the next stiffener, having found the shear at the required section from the diagram

of shear stress. In a girder of large span it is a laborious process to continue these calculations right to the centre of the span, and it is usual to take some fixed pitch at or near the latter, though it should not, in any case, exceed 6 ft. It should be observed that when calculating the pitch of rivets to fasten the stiffeners to the web, particularly in girders of small depth, it is sometimes necessary to increase the thickness of the web at the abutments, in order to come within the safe limits for bearing strength. This will, of course, necessitate a revision of the calculations for the pitch of the stiffeners. It has been pointed out that the above method assumes that the intensity of shear stress is uniform over the cross-section of the web, which is not the case; but the difference is negligible for all practical purposes; in fact, we have a margin on the safe side in calculations for the shearing and bearing strength of the rivets fastening the stiffener to the web, since we assume the intensity of shear stress to be equal to S_{max} throughout the cross-section. It is also usual to place a stiffener at the ends of the cross-girders carrying the roadway or other load, for it is found that the application of a concentrated load induces severe local stresses, and in addition to this consideration, the use of a stiffener ensures the more even distribution of the load over the whole of the web. (B. K., *Newport, Mon.*)



Views of Stinchar Bridge, Ayrshire.
One showing the old steel bridge.

Cement Waterproofing.—The architects for the Somerset Education Committee have been building new schools for the Langport Council. The large cement-concrete playground has been waterproofed with Pudlo. The work is now completed, and the architects report that they are very pleased with it.

FERRO-CONCRETE BRIDGE BUILDING IN AYRSHIRE.

Situated about 200 yds. from Pinwherry Station on the Glasgow and South-Western Railway between Glasgow and Stranraer, the bridge described and illustrated in the present article—which we reproduce from the February issue of *Ferro-Concrete*—carries one of the county highways over the river Stinchar, and was built to replace an old steel bridge which was of insufficient strength for modern traffic.

We give two views of the new bridge, which was built entirely in Mouchel-Hennebique ferro-concrete, and one view showing the old and new bridges side by side.

The arch span measures 65 ft. between the abutments, and consists of two arch ribs, 6 ft. deep at the springings, moulded so as to be monolithic with the parapets, the effective depth at the crown being 1 ft. 6 in. The ribs are connected transversely by beams spaced about 4 ft. apart, and the structure is completed by a continuous ferro-concrete decking slab 5 in. thick. The width of the bridge is 20 ft. between the parapets, which are continued up from the two arch ribs, and are treated in a very effective manner from the artistic point of view.

The bridge was designed by Mr. Robert Moir, then acting as the engineer to the Carrick District Committee of the Ayrshire County Council, the working details of the ferro-concrete construction having been prepared by Messrs. L. G. Mouchel & Partners, of Westminster and Glasgow. The contractors were Messrs. Gray's Ferro-Concrete Contracting Company, Limited, of Pollokshaws.

According to the requirement of the specification, the structure was calculated for a rolling load represented by two 17-ton steam rollers, or a static load of 150 lb. per square foot over the entire area of the roadway. Among those present at the [illegible] tests were representatives of the District Committee. Mr. MacGregor, the successor of Mr. Moir, who is now the surveyor to the Midlothian County Council, Mr. Livingstone, representing the contractors, and Mr. T. O. Dixon, district engineer for Scotland to Messrs. L. G. Mouchel & Partners.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

Loans for Isolation Hospitals.—At the last meeting of the County Councils Association the Parliamentary Committee reported the receipt from the assistant secretary of the Local Government Board, Mr. H. O. Stutchbury, of the following communication dealing with a request of the association that they should take steps to have the period for loans for isolation hospitals extended as soon as possible, even if this were done merely as a temporary measure in respect of buildings erected to meet the present emergency: "The board may say that, as a general rule, they regard a period of thirty years as sufficient for the repayment of loans in respect of buildings such as hospitals, and they would observe that many of the buildings which are being erected to meet the present emergency are of a temporary character for which a long term of repayment would be inappropriate. I am to add, however, that Mr. Herbert Samuel is willing, when opportunity offers, to consider the proposal that the limit of thirty years as the maximum period for the repayment of loans raised by county councils under the Local Government Act, 1888, should be reconsidered."

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible*

INQUIRIES HELD.

Boston T.C. (March 24th. Mr. R. H. Bicknell). £7,000 for the construction of a refuse destructor. The borough surveyor (Mr. G. L. Gardner) and other officials were present. At the conclusion of the inquiry the inspector stated that, although he hoped the Local Government Board would sanction the loan he must explain that, owing to the war, the corporation would not be able to get the money. In case the Local Loans Commissioners would be willing to lend it, and it would be very difficult to obtain it elsewhere. They would not be able to begin the works to provide employment until the Board's sanction had been given.

Cleethorpes U.D.C. (March 16th. Mr. Edgar Bedford). £9,250 for widening Grimsby-road, Cooper-road and Humberstone-road.—The surveyor, Mr. C. H. Westbrook, presented the engineering details of the scheme. The inspector said he was very much surprised to note that the council proposed to pay the Sidney Sussex College price of £24 to £2 10s. per yard for the land required in connection with the improvement. He would like to point out that the improvement would be of great benefit to the adjoining College estate, as a danger to the district by reason that the cottage which, he was informed, was owned about two-thirds of the land in Cleethorpes, might have given the land. He would be glad to hear on what grounds the council consented to pay for the land at all. Alderman Grant remarked that although he quite agreed with the criticisms of the inspector, the college had done all they could to get the land for the least price possible. The college had given them land for parks, and so forth, and the relations between the college and the council were satisfactory.

Derby T.C. (March 19th. Mr. Edgar Dudley). £4,500 for the purchase of property in Cheapside for the widening and improvement of the Wardwick. Referring to the Treasury's intention that local authorities must not expect to be able to borrow money just now as freely as they had done, the town clerk said the corporation were committed to the purchase of this property before any such restrictions were notified by the Government. The corporation fully recognised their obligations in this matter, and he should be sound prudence that no other application for sanction to borrow money would be made while the war lasted, unless it happened to be an application for urgent necessity. The borough surveyor (Mr. Jesse Wood) attended the inquiry with other officials.

Leicester T.C. (March 22nd. Mr. R. H. Bicknell). £1,994 and £3,817 for street improvement and works of sewerage in Lutterworth-road and Welford-road. The town clerk, Mr. H. A. Pritchard, and the borough surveyor, Mr. L. G. Mawley, were in attendance, and it was explained that the improvement of the Lutterworth-road was from Aylestone to near the borough boundary. The average width of the road at the present time was 48 ft., and the improvement would make it 60 ft. The owners on the west side of the road had given land on condition that a sewer was laid, and that was included in the scheme. The Road Board consented to make a grant of £586 on condition that the work would not be commenced until they gave sanction. The application with regard to Welford-road relates to the portions of that thoroughfare.

Lisburn U.D.C. (March 24th. Mr. P. C. Cowan). This was a resumed inquiry into the application of the Lisburn Council for a Provisional Order to enable it to acquire compulsorily other than by agreement certain lands for the purpose of extending the water supply for the urban district. At the same time the council applied for sanction to the borrowing of £6,000.—Mr. J. E. Crosadaile (Messrs. Swiney & Crosadaile) stated that, in his opinion, the catchment area would not affect the interests of the opposition, who would be amply protected. Mr. J. H. H. Swiney, M.Inst.C.E., was also examined. Several farmers in the district considered their lands would be injuriously affected if their present water supply were diminished or taken away.

Stone U.D.C. (March 23rd. Mr. R. H. Bicknell). £3,764 for the purpose of carrying out a scheme of alteration and addition to the waterworks pumping station.—Particulars were given of the existing works, and it was stated that the new work was a duplication of the existing pumping station. The estimated cost was: Borehole, £580; engine-house, £580; engine and pumps, £2,200; legal costs, £100. During the inquiry the inspector stated that there was no possibility of getting the money at present.

Worcester T.C. (March 24th. Mr. A. W. Brightmore). £10,275 for the purpose of water supply. When the Local Government Board granted the Provisional Order for the extension of the city, the question of the improvement of the water supply was raised until the council eventually determined upon a scheme of additional filtration. At a recent meeting of the council it was reported that a tender had been accepted for the work, but the firm subsequently withdrew it owing to the uncertainty of prices caused by the war. It was desired to provide two new filters with a total area of 2,400 sq. yds. The city engineer, Mr. T. Caink, stated, in the course of his evidence, that in Glasgow, where storage existed, the typhoid rate was one of the highest, while in Edinburgh, where filtration was depended upon to a greater extent, the typhoid incidence was very low.

APPLICATIONS FOR LOANS.

Audley U.D.C. £5,000 for the purpose of the gas works.

Aylesbury U.D.C. £640 for electricity extensions.

Barking U.D.C. £18,000 for electricity works extensions.

Darfield U.D.C. £16,218 for workmen's houses.

Devonport T.C. £17,000 for the extension of the technical school buildings.

East Stow R.D.C. £2,393 for the erection of workmen's houses.

Hertford T.C. £1,150 for the construction of a new road.

Long Sutton U.D.C. £500 for walling the proposed cemetery and tree planting.

Mountain Ash U.D.C. £2,650 for the Abercynon electric lighting scheme.

LOANS SANCTIONED.

Essex C.C. £870 for the purchase of a site at South Woodford for a new school.

Killarney U.D.C. £1,500 for road and footpath improvement.

Mountmellick R.D.C. £3,700 for the erection of labourers' cottages.

FORTHCOMING INQUIRIES.

APRIL.

		£
6.	**Kirkby-in-Ashfield.** For works of water supply (Mr. R. H. Bicknell)	2,100
6.	**Menai Bridge.** For the erection of working-class dwellings (Mr. Courtenay Clifton)	695
7.—**Hessle.**	For road improvement (Mr. R. H. Bicknell)	7,200
7.	**Lower Bebington.** For the erection of a public convenience (Mr. T. H. Tulloch)	350
7.—**Poole.**	For the purposes of water supply and sewerage (Mr. W. O. E. Meade-King)	600
7.—**Swansea.**	For works of sewage disposal (Mr. A. W. Brightmore)	20,500
—.	**Ogmore.** For works of sewage disposal (Mr. A. W. Brightmore)	19,997
—.	**Plymouth.** For the extension of the depot (Mr. W. O. E. Meade-King) ...	5,500
9.	**Abercarn.** For the purpose of the gas undertaking (Mr. A. W. Brightmore)	1,850

TOWN PLANNING.

20. **Croydon.** (Mr. George L. Pepper)

Motors for Assistant Surveyors. — The Finance Committee of the Derry County Council have unanimously agreed to recommend the council to provide all the assistant surveyors in the county with motor bicycles, with a view to facilitating them in their work. The proposal was strongly supported by the county surveyor (Mr. C. L. Boddie), who stated that two of the surveyors were provided with motor cycles some time ago and the advantages had been very material. One of the machines had been in use now for two and a-half years, costing in maintenance £9 7s. 7d., and the mileage covered during that period was 11,745, or approximately 4,700 miles per annum.

Municipal Work in Progress and Projected.

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The following are among the more important projected works of which particulars appear below:—Barking's Tottenham housing and town planning schemes; Swansea roads and materials—Kesteven, Lakeside reservoir and sewage disposal—Ashby, Audley water-mains and electricity—Luton, Hampstead. Further particulars of other works projected will be found in our Local Government Board Inquiries" page.

BUILDINGS.

Bedford T.C. It is proposed to build an electricity sub-station in Campbell-road.

Gravesend T.C. It is proposed to enlarge the Central school, at an estimated cost of £800.

Isle of Wight R.D.C. A scheme estimated to cost £650 is to be submitted to the War Department and the county council for the extension of the sea wall at Yaverland.

Kesteven C.C. The county council are pressing upon the Grantham and Sleaford Rural District Councils and the Sleaford and Rackheath Urban District Councils the necessity for proceeding with the provision of isolation hospitals.

Lees (Lancs) U.D.C. The building of new mortuary and lobby, which has been approved by the Local Government Board, has been postponed for three months.

Tottenham U.D.C. The Education Committee have approved schemes for two extensions at Vale-road and Park-lane, for 900 and 750 children respectively.

Tyrone C.C. Mr. Lennon, surveyor for the northern division, has reported serious defects to Monaghan Bridge, on the road between Newtownstewart and Drumquin. The whole bridge, in his opinion, would fall in a year or two, and must be replaced at a cost of £250, to be shared by Strabane and Castlederg districts. Drumshambo Bridge, about 2 miles distant from Monaghan bridge, over the same river, is also in a very bad state, and must be renewed within the next few years.

HOUSING AND TOWN PLANNING.

Holywell R.D.C.—As the result of a communication from the Local Government Board, the proposed housing scheme will be deferred.

Swansea T.C.—The council decided recently to proceed with the erection of 500 houses on the Town Hill estate, at a cost of about £121,000. They proposed to applied to the Local Government Board for power to borrow the requisite money, and last week a letter was received from that body refusing the application on the ground that the present was not an opportune time for the borrowing of money. The Housing Committee have instructed the town clerk to bring the matter before the board with a view of seeing if they could not modify their view.

Ystradgynlais U.D.C.—It has been decided to proceed with the scheme for the erection of twenty workmen's houses at Abercrave. An application from Mr Rogers, contractor, for a bonus of £500 on account of increased cost of materials and the fact that a number of houses were ready before the proper time, has been deferred.

ROADS AND MATERIALS.

Barking U.D.C. It has been decided to metal the centre of River-road, at an estimated cost of £800.

Bispham U.D.C.—The surveyor, Mr. T. Harrop, has received instruction to prepare a scheme for widening the northern side of Red Bank-road.

Clackmannanshire C.C.—In deference to a recommendation by the Road Board, it has been decided to postpone the larger part of the road improvement scheme for 1915-16 (for which a grant had been promised), which was estimated to cost £3,420.

Dartford R.D.C.—Consideration is being given to a proposal to make up Castlestreet.

Dover R.D.C.—The surveyor, Mr. F. Sergeant, reported recently that the Military required that the old Roman road from the rear of Old Park road across the fields to Sandwich Hole should be repaired. The council had slightly repaired a part of the road elsewhere, but they had never repaired the road, and there was no foundation for a road at all. It would cost £2,000 to make a proper military road across there. He had not made an estimate for he was going to see the Road Board, and would mention the matter and see what they wanted.

Finchley U.D.C. The surveyor, Mr. C. J. Jenkin, has been asked to prepare an estimate of the cost of widening Hendon-lane, near the church gates, and also for widening the Great North road, from Walfield Bank to the county boundary, from 50 ft. to 60 ft.

Hertford T.C.—A scheme has been prepared by the borough surveyor, Mr. J. H. Jevons, for the construction of a road to connect Port Vale with North-road and the new Great Northern station. The estimated cost is £2,450, towards which the railway company will contribute £1,000.

Kesteven C.C.—It is reported that the Holland County Council have agreed to join with this council in a scheme for the improvement of the Bridge End road, at an estimated cost of £1,200 per mile. The War Office, the Treasury and the Road Board will, it is anticipated, bear a considerable proportion of the cost.

Newhaven R.D.C.—The council last week passed a resolution recommending the county council to postpone all work on the Lewes-Newhaven road at present as it prevents farmers getting men, and in that way keeps up the price of food.

Stockton R.D.C.—A scheme has been adopted for the repair of the main road between Stockton and Yarm.

Uckfield U.D.C. [illegible] connected to the [illegible] sewerage, for consideration, approved [illegible] estimated cost of £4,200.

Walton-on-Thames U.D.C.—The surveyor, Mr. R. Wilds, has received instructions to make up the first [illegible] Station-road.

Watford U.D.C.—The surveyor, Mr. D. Waterhouse, has submitted a report stating that the county surveyor, in the application for a grant from the Road Board, was including the reconstruction of Queen-street with wood paving, and of Woodford-road, St. Albans-road, Station-road, and Clarendon-road, with [illegible] macadam.

Winchester T.C. A loan of £2,600 is to be taken up for wood paving at St. Cross.

SEWERAGE AND SEWAGE DISPOSAL.

Ashby R.D.C. Plans have been prepared for the construction of sewers and a sewage outfall for part of Donisthorpe.

Audley U.D.C.—Consideration is to be given to a sewerage scheme for the district.

Christchurch T.C.—The plans and specifications prepared by the borough surveyor, Mr. H. J. Farmer, for the drainage of the added areas have been forwarded to the Local Government Board for their sanction.

Hornsey T.C.—It is proposed to construct a storm-water [illegible] between the railway bridge and Alexandra road, at an estimated cost of £450.

Sevenoaks R.D.C.—It is proposed to carry out works of sewerage at Morris Green, at an estimated cost of £1,850.

WATER, GAS, AND ELECTRICITY.

Fortar T.C. New carbonising plant is to be installed at the gasworks at an estimated cost of £10,000.

Hampstead B.C.—The council have approved a scheme, estimated to cost £17,300 for the extension of the electricity undertaking.

Poplar B.C.—A profit-sharing scheme is recommended to the council by the Electricity Committee. It begins with a general reduction of charges from April 1st, so that the council, as consumer of electricity, will benefit proportionately with other consumers. Any surplus profits will then be apportioned on a scale of percentages, including 20 per cent bonus among officers and workmen and 10 per cent to the general borough fund.

Saffron Walden T.C. The gas undertaking earned a nett profit of £839 in the last financial year.

West Ward (Westmorland) R.D.C. For many years the council have had under consideration the question

of supplying a large part of North Westmorland -an area comprising sixteen parishes—with water from one source, and last year a Local Government Board inquiry was held into a scheme for supplying the area from Blea Water Tarn, near Mardale, at an estimated cost of between £35,000 and £40,000. The council have now resolved that no further steps be taken in connection with the scheme until after the termination of the war. This decision is due to the greatly increased cost of materials and labour, and to the enhanced interest required upon borrowed money.

MISCELLANEOUS.

Middlesex C.C.—The wages of council roadmen receiving 36s. a week or less are to be increased by 2s. a week on their existing normal wage, the increase to date from March 1st last.

Paignton U.D.C.—The question of the repair of the sea wall at Preston has been under consideration owing to considerable damage which was recently sustained, and the council agreed that it would be preferable, instead of incurring the cost of the repairs, to proceed with the negotiations for the requisition of the beach, which was described as a possible valuable asset to the town.

Stoke-on-Trent T.C. — A committee has been appointed to consider the agreement with the Potteries Electric Traction Company for a renewal of the lease of the tramways.

BELGIUM TOWN PLANNING COMMITTEE.

Viscount Bryce, O.M., has consented to become president of the newly formed Belgium Town Planning Committee which has been constituted by the amalgamation of the various committees previously considering the question of the replanning of Belgium. The committee, which is under the patronage of the Belgian Government, has Mr. Raymond Unwin as chairman and Mr. Ewart G. Culpin as secretary.

Following upon the recent highly successful conference at the Guildhall, London, the next step will be the opening of a Belgian exhibition at University College, Gower-street, W.C. It is hoped that Lord Bryce will open the exhibition on April 6th, and it will remain open until the end of the month.

At the same time study circles of architects, lawyers, and others will be instituted for the consideration of the actual facts of town planning, but on the legal and technical sides; lectures and conferences will be held for municipal councillors and the general body of the public in order to educate them in these matters. University College has kindly provided studio and office accommodation.

Money is urgently needed to carry on the work, and may be addressed to the secretary at the School of Architecture, University College.

FOR OTHER ADVERTISEMENTS
See End of Paper.

URBAN DISTRICT COUNCIL OF HORNCASTLE.

ROAD MATERIAL.

The above Council invite Tenders for Supplying the following Road Material—viz.:—

390 tons (more or less) of X Granite.
270 tons (more or less) of XX Granite.
200 tons (more or less) of 2½-in. Slag.
80 tons (more or less) of ½-in. Clean Slag Chips.
20 tons (more or less) of Slag Dust.

To be delivered at Horncastle Station as and when required by the Council's Surveyor (the Contracts to be completed by 30th September next, and security for the due performance thereof must be given).

Small Samples to be sent to the Surveyor, Mr. F. Weeber, Foundry-street, Horncastle.

Forms of Tender can be obtained from the undersigned.

The Council do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, marked "Road Material," must be delivered to me not later than 2 p.m. on Monday, 19th April next.

(By order)
R. W. CLITHEROW.
Clerk to the Council.

Court House, Horncastle.
March 30, 1915. (2,519)

PERSONAL.

Mr. J. C. Trounson has been appointed deputy borough surveyor of Plymouth.

Mr. William J. Cook, surveyor to the Aylesbury Rural District Council, has resigned.

Mr. T. Ingle, Colne, has been appointed highway surveyor to the Louth Rural District Council.

Mr. J. Pickup has been appointed building inspector to the Burnley Corporation in succession to Mr. T. Cross, deceased.

Mr. W. H. G. Browne, surveyor and inspector to the Bolsover Urban District Council, has been appointed supervising sanitary inspector at British Guiana.

Mr. J. G. Howard, assistant surveyor to the Berkhamsted Rural District Council, has been appointed surveyor and inspector to the Salcombe Urban District Council.

Mr. J. R. Hadfield, surveyor to the Berkhamsted Urban District Council, has received the congratulations of his council upon obtaining the diploma as an associate member of the Institution of Civil Engineers.

Mr. George D. Macniven, L.R.I.B.A., of the firm of Messrs. Greig, Fairbairn & Macniven, architects, has been appointed assistant architectural inspector to the Local Government Board for Scotland, under the Housing Acts, and more particularly in connection with the scheme for the housing of Admiralty employees at Rosyth.

Mr. F. W. Bricknell is recommended by the Works Committee of the Hull Corporation for the office of city engineer, in succession to Mr. A. E. White, who retired last year. Mr. Bricknell, who entered the service of the corporation thirty-eight years ago as a pupil, has since Mr. White retired acted as city engineer. The salary has been fixed at £750, with annual increases of £50, till the maximum is reached.

Mr. David M. Jenkins, Assoc.M.Inst.C.E., whose paper, "Notes on Extraordinary Traffic on Highways," read at last Saturday's district meeting of the Institution of Municipal and County Engineers at Cardiff, is reproduced elsewhere in this issue, was appointed borough engineer and surveyor of Neath in 1886, and subsequently water engineer and engineer to the corporation electrical undertaking. He has carried out many important works in the borough which he serves. He has acted as arbitrator in sewerage compensation cases and in boundary and other disputes, and has had considerable Parliamentary experience in connection with schemes promoted by his own and other authorities.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

EAST MIDLAND DISTRICT.

An East Midland District meeting is to be held at the Town Hall, Loughborough, on Saturday, April 10th.

Programme.

2.15 p.m.—The members and visitors will be received in the Council Chamber by the Mayor of Loughborough (Mr. W. W. Coltman, J.P.).

2.30 p.m.—To receive minutes of last meeting.
To elect district committee.
To discuss election of district representative, district chairman, and district secretary.
To consider any other general district business.

3 p.m.—Proceed in conveyances (at a charge of 1s. per person) to inspect the swimming baths, where members will be given the opportunity of inspecting an apparatus for teaching swimming, erected by Messrs. Herbert Morris, Limited, of Loughborough.
Proceed to sewage farm to inspect refuse destructor and other works.

5 p.m.—Arrive at town hall, where tea will be provided by the borough surveyor, Mr. A. H. Walker, Assoc.M.Inst.C.E.

E. H. Crump, Assoc.M.Inst.C.E.,
Hon. District Secretary.

Hinckley.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. W. H. Matthews Jones, City Engineer and Surveyor, Chester.

NORTH-EASTERN AND EASTERN DISTRICTS.

A meeting of the North-Eastern and Eastern Districts of the institution will be held at Newark-on-Trent on Saturday, April 24th.

1.45 p.m.—Meet at the Saracen's Head Hotel, and proceed to the inspection of old castle ruins. En route Ossington Coffee Palace, Trent Bridge and free library will be pointed out.

Parish church (exterior and interior). A short organ recital will be given by Mr. W. F. Wright, A.R.C.O., organist.

Old Magnus Buildings, with Tudor Hall, recently restored at a cost of £2,000 by Mr. H. W. Lockton, M.S.A. (member).

Various old buildings in Market-place.

Beaumond Cross.

New Magnus Grammar School (by the kindness of the Rev. H. Gorse, M.A., head master), designed by Mr. Lockton, and carried out at a cost of over £10,000.

5 p.m.—High tea at the Saracen's Head Hotel, at a cost of 2s. 6d. per head.

Short descriptive notes of the visits will be given by Mr. Lockton, and by Mr. P. A. Watford (member), surveyor, Claypole Rural District Council.

Members of the Yorkshire and other districts are invited to attend.

G. Bellson Chilvers,
Hon. District Secretary.

Oundle, Northants.

SOCIETY OF ENGINEERS.

At a meeting of the Society of Engineers to be held on Tuesday, April 13th, at the Institution of Electrical Engineers, Victoria Embankment, W.C., a paper, entitled "Main Roads, Past and Present, and Modern Methods of Construction and Maintenance," will be read by Mr. Frank Grove, M.I.M. and Co.E., assistant county surveyor of Surrey, the following being a synopsis:—

Brief history of roads from the time of the Romans to the present day—Traffic requirements immediately prior to the introduction of self-propelled vehicles—Details of road construction at that time—Effects of motor traffic on the old type of roads, and some methods employed to cope therewith—Description of a few of the modern methods of road construction and maintenance employed during recent years in the county of Surrey.

The chair will be taken at 7.30 p.m.

A. S. E. Ackermann,
Secretary.

17 Victoria-street, S.W.

Town Planning Institute.—We have received a copy of the first issue of the "Proceedings" of this institute. It relates to the first of three meetings held to discuss the Ruislip-Northwood town planning scheme. The reports of all meetings can be obtained from the secretary, Mr. A. R. Potter, 4 Arundel-street, W.C., price 1s. per copy.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

INSPECTOR OF NUISANCES.—April 3rd.—Twickenham Urban District Council. £140—£170 per annum.—Mr. H. J. Saunders, clerk.

ASSISTANT SURVEYOR AND INSPECTOR.—April 6th.—Kingswood Urban District Council. 25s. per week.—The Clerk, Council Offices, Kingswood, Bristol.

TEMPORARY ENGINEERING ASSISTANT.—April 6th.—Wantage Rural District Council. £2 12s. 6d. per week.—Mr. John W. Harris, engineer and surveyor, East Challow, Wantage, Berks.

SUPERINTENDENT OF HIGHWAYS.—April 8th.—Corporation of Huddersfield. £130 per annum.—Mr. K. F. Campbell, borough engineer and surveyor, 1 Peel-street, Huddersfield.

DRAUGHTSMAN.—For the Nigerian Government Railway. £300—£350 per annum.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

COST CLERK.—Sheffield Corporation.—General Manager, Water Department, Town Hall.

CLERK OF WORKS.—Ivybridge Urban District Council. £3 3s. per week.—Mr. Harry Francis, engineer, 12 Lockyer-street, Plymouth.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

WHITEHAVEN.—April 21st.—Competitive designs for laying out the coach road site (6 acres 1 rood 25 poles) and the erection of houses, for the town council. Premiums, 30, 20 and 10 guineas.—Mr. T. Brown, town clerk.

GALEMIRE.—Designs for a small hospital, for the Galemire (Whitehaven) Joint Hospital Committee.—Mr. E. B. Croasdell, clerk, Union Hall, Whitehaven.

STEPNEY.—Designs for municipal buildings, for the borough council. Mr. H. T. Hare, F.R.I.B.A., has been appointed assessor.—Mr. G. W. Clarke, town clerk, 15 Great Alie-street, Whitechapel.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

ANGLESEY.—April 7th.—For the erection of new schools, for the Education Committee.—Mr. J. Owen, county architect, Menai Bridge.

TRURO.—April 8th.—For the erection of a clock turret in steel and concrete and other works, for the corporation.—Mr. F. A. Barnes, city engineer and surveyor.

WINDSOR.—April 8th.—For the erection of bathing boxes, for the corporation.—Borough Surveyor, Almaroad, Windsor.

TRURO.—April 8th.—For the erection of a clock turret in steel and concrete, and alterations to the council chamber, for the corporation.—Mr. F. A. Barnes, city engineer.

HYTHE.—April 9th.—For building a timber-framed and corrugated-iron isolation hospital for eight beds, for the corporation.—Mr. Chris. Jones, borough surveyor, Hythe, Kent.

CORNWALL.—April 10th.—For the erection of a school, for the Education Committee.—Mr. B. C. Andrew, architect, Biddicks-court, St. Austell.

TYRONE.—April 12th.—For additions to Dungannon House, and the erection of a pavilion and medical officer's residence, for the county council.—Mr. J. A. Hunter, Lisburn.

EASINGTON.—April 13th.—For the erection of fifty houses, and the construction of streets, for the rural district council.—Mr. G. Waterhouse, architect, Council Offices.

ASHINGTON.—April 17th.—For the erection of gasworks, for the urban district council.—Messrs. W. A. Valon & Son, Caxton House, Westminster, S.W.

CHERTSEY.—April 22nd.—For the erection of an additional engine-house, gas generating house, new workshop and coal store adjoining the present pumping station, Byfleet Village, together with engine-sheds and other buildings, for the rural district council.—Mr. Charles Muggleton, Byfleet-corner, West Byfleet.

TETBURY.—April 23rd.—For sinking a borehole, for the urban district council.—Mr. H. J. Weaver, consulting engineer, Northgate Mansions, Gloucester.

GLASGOW.—April 29th.—For the wright and joiner's work in connection with the erection of a sanatorium and children's home, for the corporation. —Office of Works, 64 Cochrane-street, Glasgow.

Roads.

KEIGHLEY.—April 3rd.—For laying tar-macadam on 700 sq. yds. of roads and footpaths, for the Joint Hospital Board.—Messrs. Moore & Crabtree, Town Hall-square, Keighley.

PATRINGTON.—April 3rd.—For the supply of road stone, for the rural district council.—Mr. W. H. Snaith, surveyor, Patrington, near Hull.

RAMSEY.—April 3rd.—For the supply of tarred slag, broken granite, and granite chips, for the urban district council.—Mr. R. F. Serjeant, clerk.

TENTERDEN.—April 5th.—For the supply of granite or other approved macadam, for the rural district council.—Mr. W. L. C. Turner, district surveyor, Tenterden.

BOLTON-UPON-DEARNE.—April 5th.—For carrying out street works, for the urban district council.—Mr. J. W. Wilson, surveyor.

FOOTS CRAY.—April 5th.—For the supply of road materials, for the urban district council.—Mr. W. A. Farnham, surveyor, Sidcup.

BENTLEY.—April 5th.—For the supply of tar-macadam, whinstone and dross, for the urban district council.—Mr. R. G. Whitley, surveyor.

BILLERICAY.—April 5th.—For the supply of granite, Kentish rag, Kentish flints, gravel, screenings, sand, cartage, and man and horse hire, for the rural district council.—Mr. F. E. Ennals, surveyor, Shelley-road, Hutton, Essex.

GLASGOW.—April 6th.—For paving several streets with compressed rock asphalt, for the corporation.—Office of Public Works, 64 Cochrane-street.

SHILDON.—April 6th.—For the supply of broken whinstone, slag, and tarred whin and slag, for the urban district council.—The Surveyor.

DUMBARTONSHIRE.—April 7th.—For the supply of whinstone, for the county council.—Mr. J. F. Robertson, 179 West George-street, Glasgow.

KINGSTON-UPON-THAMES.—April 7th.—For the supply of 1,700 tons of Guernsey, Quenast, or other granite, for the corporation.—Mr. R. Hampton Clucas, borough surveyor.

HUDDERSFIELD.—April 7th.—For the supply of 490,000 creosoted Baltic red wood blocks, size 9 in. by 3 in. by 5 in. deep, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

HORNSEY.—April 7th.—For making up a passageway, for the town council.—Mr. E. J. Lovegrove, borough engineer and surveyor.

SWANSEA.—April 7th.—For the supply during the year to end March 31, 1916, of about 1,000 tons of tar-macadam and about 30,000 gallons of tar, for the corporation.—Borough Surveyor, 13 Somerset-place, Swansea.

HOUGHTON-LE-SPRING.—April 8th.—For the supply of machine-broken blast-furnace slag, hand-broken whinstone, slag, and blue limestone riddlings, for the rural district council.—Mr. D. Balfour, 3 St. Nicholas' Buildings, Newcastle-on-Tyne.

ALTON.—April 8th.—For steam rolling and the supply of broken granite, for the rural district council. —Mr. C. W. Maudsley, surveyor, Park-close, Alton, Hants.

BULKINGTON.—April 10th.—For the supply of broken granite and haulage, for the urban district council.—Mr. C. Blakeway, clerk, 2 Church-street, Nuneaton.

ALTON.—April 10th.—For the supply of tarred or Ayr Clee Hill basalt, for the urban district council.—Mr. G. Bertram Hartfree, surveyor, Town Hall, Alton.

MYNDDISLWYN.—April 12th.—For the construction of Ynysddu new road, for the urban district council.—Mr. E. Watkin Edwards, engineer, Council Offices, Pontllanfraith.

MALDEN & COOMBE.—April 13th.—For making 2 unclassified roads, comprising South-lane, part of, measuring 886 ft.; for paving with artificial stone slabs the footways in South-lane; and for constructing 625 yds. of 18-in. and 15-in. concrete tube, and about 82 yds. of 9-in. stoneware pipe surface-water sewer, together with manholes, for the urban district council. Mr. R. H. Jeffes, engineer and surveyor.

EXETER.—April 14th.—For doubling the tramway track in Blackboy-road, and the reconstruction of the tramway track in Pinhoe-road, including the necessary excavation, concrete foundation, paving with granite setts, and about 30 tons steel rails, for the city council.—Mr. Thos. Moulding, city engineer and surveyor.

BENFIELDSIDE.—April 17th.—For the supply of machine-broken whinstone, machine-broken slag, tarred slag-macadam, and limestone dust, for the urban district council.—The Surveyor, Council Offices, Shotley Bridge.

ISLE OF THANET.—April 21st.—For the supply of 1,533 yds. broken flints, and 1,295 tons broken granite, for the rural district council.—Mr. G. L. Butterworth, surveyor, Birchington, near Ramsgate.

Sanitary.

MANSFIELD.—April 3rd.—For laying stoneware pipe sewers, for the corporation.—Mr. T. P. Collinge, borough engineer and surveyor.

STANLEY.—April 5th.—For cleansing ashpits and removing house refuse, for the urban district council. —Mr. J. G. Ridley, clerk.

CHURCH.—April 5th.—For work of sewerage, for the urban district council.—Mr. J. B. Fallowfield, surveyor, Church, Lancs.

PRESTWICH.—April 6th.—For the construction of a storm-water drain, tube sewers, and manholes, for the urban district council.—Mr. S. H. Morgan, engineer, Prestwich, Lancs.

RUISLIP-NORTHWOOD.—April 7th.—For certain supplementary works for sewage disposal at the purification works, consisting of sedimentation tank, bacteria beds, humus tank, pipe connections, sluice gates, valves, and other fitments, for the urban district council.—Mr. H. Howard Humphreys, consulting engineer, 28 Victoria-street, Westminster, S.W.

UXBRIDGE.—April 8th.—For the construction of a sewerage scheme, for the rural district council.—Mr. J. W. Harrison, engineer and surveyor.

SWANSEA.—April 8th.—For the construction of stoneware pipe sewers, and manholes, for the corporation.—Borough Engineer.

DEWSBURY.—April 9th.—For the supply of disinfecting powder and disinfecting fluid, for the corporation.—Mr. B. Ellis, town clerk.

THURROCK.—April 19th.—For the construction of about 4 miles of stoneware and iron sewers of 9-in., 12-in. and 15-in. diameter, with manholes and other appurtenances, engine-house, screen chambers, suction tank, and about 1¼ miles of 12-in. pumping main, for the Joint Sewerage Board.—Mr. G. Midgley Taylor, engineer, Caxton House, Westminster, S.W.

RAWMARSH.—For relaying part of the main sewers in the South Ward, comprising about 700 yds. of 18-in. pipes or tubes, and 700 yds. of 9-in. pipes, with manholes, flushing chambers, and ventilation shafts, for the urban district council.—Mr. J. A. Tonge, engineer, Parkgate, Yorks.

Stores.

SHILDON.—April 6th.—For the supply of broken whinstone, slag, tarred whin and slag, concrete and freestone kerbs, sweeps and flags, cement, screws and paving bricks, sanitary pipes, disinfectants, brooms, shovels, spades, gullies, and manhole covers, for the urban district council.—Mr. J. Arthur Wood, clerk, Council Offices.

SOUTHAMPTON.—April 7th.—For the supply of stores and material, including broken granite, for the corporation.—Borough Engineer.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted † Recommended for acceptance
: Provisionally accepted

EAST PRESTON.—For the supply of tar, for the rural district council.—Mr. C. W. Leney, surveyor.—
Forbes, Abbot & Leonard, Shoreham, Sussex.—3½d. per gallon, Road Board specification No. 2, 3½d. dehydrated.
A. Dickinson & Co., Deptford.—3½d. dehydrated.
Worthing Gas Company, Worthing.—3½d. crude.
Littlehampton Gas Company, Littlehampton.—3d. crude.
Arundel Gas Company, Arundel.—3d. crude.

HAMMERSMITH.—The following tenders have been accepted by the borough council:—

Artificial Stone.—Alexander Payne Stone Company, Limited, London, W.C.

Ballast (River).—Cums, Limited, St. Dunstan's-hill, E.C.

Bricks.—J. Knowles & Co., London), Limited, St. Pancras, N.W.

Brooms and Brushes.—F. Smith & Co., Borough High-street, S.E.

Carbolic Soap and Permanganate of Potash.—Middleton Brothers, St. Georges-road, E.

Carbolic Powder.—Forbes, Abbott & Leonard, King William-street, E.C.

Carbolic Acid.—Ashcrofts, Limited, London, N.

Coal (House).—G. Hinchliffe & Co., Lloyd's avenue, E.C.

Coke.—C. Franklin, Pancras-road, N.W.

Granite.—J. Mowlem & Co., Limited, Westminster, S.W.

Harness.—Ryde & Son, Blackfriars-road, S.E.

Horses, Carts, and Men.—R. J. Greenham, Fulham, S.W.; J. Latter, College Park, N.W.

Lime and Cement.—J. Knowles & Co., London, Limited, St. Pancras, N.W.

Manure.—G. & M. Wells, Isleworth.

Oilman's Goods.—Middleton Brothers, St. George-street, E.

Stable Utensils.—C. J. Bradshaw, Hammersmith, W.

Stoneware Pipes.—J. Knowles & Co., London, Limited, St. Pancras, N.W.

Stores.—F. Bird & Co., Oxford-street, W.

Timber (Hard).—A. Stevens, London, E.

Timber (Soft).—F. H. Norman & Co., Mount Pleasant, W.C.

Turning of Wheels.—J. G. Newell, Bermondsey, S.E.

York Stone.—Bentley & Smith, Limited, Yorks.

Sulphur Candles.—Sanitas Company, Limited, Limehouse, E.

HARTISMERE.—For the supply of 700 tons of best granite and 1,200 tons of pit stone for the rural district council:—

GRANITE.

	Tons
Ellis & Everard, Peterborough	600
C. Abell, Limited, Newmarket	300
Lavender & Bateman, Sutton Bridge	500
Enderby and Stoner, Stanton Concrete Company, Enderby	1,000

PIT STONE.

	Tons
C. F. Acton, Weaponness	1,200

STEAM ROLLER.

W. J. Smeeth & Son, Rochford.

ILFORD.—Accepted for making up certain roads for the urban district council:—Mr. H. Shaw, engineer and surveyor.

Parsons & Parsons, Ilford, Audley Arden, 681 Auckland road, £332; Colombo-road, £73.

NEWPORT (Mon.).—For the execution of private street works, for the corporation:—Mr. H. Tremellyne, borough engineer.

J. H. Monks, Dock-street, £1,449.

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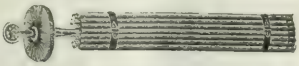

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Telegraphic Address: "SPLENDOUR, LONDON." Telephone Numbers, Palmers Green, 635 & 636.

THURNSCOE.—For the supply of broken granite, granite chippings, broken slag, slag screenings, flags, kerbs, channelling, and asphalt, for the urban district council.—Mr. T. Bull, surveyor:—
Whinstone.—Ord & Maddison, Darlington, 12s. 2d. per ton; R. Summerson & Co., Limited, Cockfield, 12s. 2d. per ton.
Slag.—J. Parker & Sons, Limited, Sheffield, 5s. 6d. per ton; J. Green & Sons, Silsden, 6s. 3d. per ton.
Slag (large). Prestwich & Sons, Dronfield, 1s. 10d. per ton.
Limestone.—J. Green & Sons, Silsden, 8s. per ton.
Tarred slag.—J. Parker & Sons, Sheffield, 12s. per ton; J. Green & Sons, Silsden, 12s. 9d. per ton.
Kerbs, &c.—C. H. Widdison, Stairfoot.
Brushes.—E. Russum & Son, Limited, Rotherham.
Pipes.—J. Parker & Sons, Limited, Sheffield.

WAKEFIELD.—For the construction of a concrete culvert in tunnel, for the corporation. Mr. J. P. Wakeford, city surveyor.
Parker & Sharp, York.

WAKEFIELD.—For relaying a sewer, for the corporation. Mr. J. P. Wakeford, city surveyor:—
Parker & Sharp, York.

WEMBLEY.—For making up two roads, for the urban district council. Mr. C. R. W. Chapman, surveyor.

	Chatsworth	Waverley.
E. Free & Sons, Maidenhead	£726	£1,041
T. Adams, Wood Green	712	1,019
E. T. Bloomfield, Tottenham	708	1,019
A. Wooster, Wealdstone	674	954
F. G. Brummell, Willesden	661	964
Willis & Powis, Wembley	633	905
Surveyor's estimate	632	887

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

APRIL

10.—Institution of Municipal and County Engineers: East Midland District Meeting at Loughborough.
13.—Society of Engineers: Mr. Frank Grove, assistant county surveyor of Surrey, on "Main Roads, Past and Present, and Modern Methods of Construction and Maintenance." Institution of Electrical Engineers, 7.30 p.m.
14.—Institute of Sanitary Engineers: Mr. W. J. E. Binnie, M.Inst.C.E., F.G.S., on "Corrosion of Iron and Steel Pipes and the Protective Methods to be Adopted." Caxton Hall, Westminster, 8 p.m.

MAY.

28.—Royal Sanitary Institute: Meeting at Shrewsbury. Discussion on "The Value of Mechanical Filters in the Purification of Water." 7.30 p.m.

APPOINTMENTS WANTED.

WANTED, a situation as Steam-roller Driver; Urban District preferred; good reference. Box 2,516, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,514)

TENDERS WANTED.

DEVON COUNTY COUNCIL.

SURFACE TARRING.

Tenders are invited for Surface Tarring with Refined Tar about 118 miles of Rural Main Road in North Devon.

Forms of Tender, Specification, and Schedules may be obtained from the under-signed, to whom sealed Tenders, endorsed "Surface Tarring," must be delivered not later than Monday, April 19, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

R. M. STONE,
County Surveyor
(No. 1 Division).

The Square,
Barnstaple.
March 30, 1915. (2,517)

Chief Offices:—352 to 364 Euston Road, London, N.W.

Telegrams: 'Courteous, Eusroad, London.' Telephone No.: Museum 3032 (5 lines.)

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SOME USEFUL BOOKS.

DRAINAGE WORK AND SANITARY FITTINGS. By WILLIAM H. MAXWELL, A.M.Inst.C.E., Borough and Waterworks Engineer, Tunbridge Wells Corporation. Third Edition. Revised and Enlarged. Cloth Boards, 2s. nett. Post free, 2s. 2d.

HOW TO BECOME A MUNICIPAL ENGINEER. By the late J. FREEBAIRN STOW. 2nd Edition. Revised by SYDNEY G. TURNER, Assoc.M.Inst.C.E., Barrister-at-Law, etc. Crown 8vo. 1s. nett. Post free, 1s. 1d.

MUNICIPAL ENGINEERING. Model answers to questions set at recent Examinations of the Incorporated Association of Municipal and County Engineers. 4½ in. by 6¾ in. 200 pp. Cloth, 3s. 6d. Post free, 3s. 8d.

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For other materials and address, see page

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ANY DESCRIPTION

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The Surveyor

And Municipal and County Engineer.

Vol. XLVII. APRIL 9, 1915. No. 1,212.

Minutes of Proceedings.

Royal Commission on Sewage Disposal: The Ninth Report.

It must not be imagined that with the Ninth Report of the Royal Commission on Sewage Disposal we get a solution of the problem of the treatment of trade wastes. We are practically at the beginning of a great work, which can only be done after certain very important legislative changes have been made, followed by an enormous amount of scientific research and practical work. The commissioners, having drawn attention to the filthy state of rivers and streams in manufacturing districts, urge once more the need for an alteration in the existing law, giving manufacturers the right to discharge their wastes into sewers. It is not to be expected that manufacturers will be able or willing to undertake the scientific investigations required before they can know how to render their particular wastes harmless. As long as ignorance prevails they cannot be forced by law to adopt a process which has not been invented; further, if any manufacturer should take the trouble to find out how to purify his waste, he would merely render himself and others of the same trade liable to the expense of constructing purification works. Legislation is therefore needed for the more general reception of trade wastes into sewers, for the improved supervision of rivers, and for the prosecution of scientific research.

The Ninth Report merely paves the way for further investigations, and indicates the lines upon which the work should be started. A careful but necessarily incomplete account of trade processes producing liquid wastes is given, and the means which are available, or which might be made available, for the treatment of such wastes are discussed. A good deal of interesting and valuable data has thus been collected, but the subject is so great and the number of instances in existence so overwhelming that no complete statement of the various methods possible and in use can be made. For years to come this must be a fruitful field for investigations and experiments. Scientific research will not alone solve the problem, but scientific research, plus trial and error and careful attention to what has been done up to the present, will ultimately bring about purification of our rivers, combined with general economy both to the public and to the manufacturers. For instance, at some works large settling tanks have been erected owing to the wasteful and unscientific methods adopted. Not only has there been unnecessary expense in construction, but there is permanent continuous waste of water entailed. Thus ignorance causes waste in many cases. Although it is practicable to purify some trade wastes at reasonable cost, the commissioners report that there are others of which they know no examples showing that purification is possible in the present state of knowledge. Hence it is not to be assumed that measures which are applicable to the regulation or prevention of sewage pollution are necessarily applicable to the case of trade pollution. That is to say, that it is at present impossible to suggest a single standard for trade wastes which could be universally applied [illegible] as was suggested in connection with domestic sewage in the Eighth Report. Neither is it possible to legislate for trade pollution generally without distinguishing between the different conditions affecting different trades. The commissioners have not been able to investigate perfectly the different effects produced under different local conditions by each class of trade waste. This work must be done subsequently by an authority appointed for the purpose. The commissioners do, however, think it possible and useful to suggest limits of impurity for certain trades discharging effluents, though they consider it impossible to lay down as regards each trade such a standard as would ensure complete purification of rivers, since in the present state of knowledge the attainment of such a standard would be financially impossible and therefore [illegible]. The limits of impurity suggested by the commissioners will certainly form a useful basis upon which to work, but are not intended as a final pronouncement on river purification. We must look forward to improved methods which will secure a higher degree of purification, and, moreover, under the system proposed it will be open to any rivers authority to require a higher degree of purification in any special case provided they can prove to the central authority that it is necessary and practicable.

A careful study of this most interesting and valuable report confirms the impression conveyed by preceding reports—namely, that there is the greatest need for further investigations and experiments. The commissioners freely admit that they have been unable to explore many fields that are known to require investigation, and they point out also that, even had they been able to do so, there would still remain the fresh problems arising out of social, industrial and scientific developments. This is particularly true with regard to the question of trade waste treatment, which has not hitherto received the attention which has been given to the purification of ordinary sewage, bearing in mind, moreover, that with the growth of new trade processes, and with the alteration of others, trade wastes are likely to be ever changing in character.

Extraordinary Traffic: The Surveyor's Certificate.

The surveyor's certificate being an essential preliminary to the right of a highway authority to recover extraordinary traffic expenses, it is of great importance that this document should be properly framed. It will be remembered that the right to recover only arises where it appears by the certificate that, "having regard to the average expense of repairing highways in the neighbourhood, extraordinary expenses have been incurred . . . in repairing such highway by reason of the damage caused by excessive weight . . . or extraordinary traffic" (Highways and Locomotives Amendment Act, 1878, sec. 23). There has been considerable difference of opinion as to the effect of the words "having regard to the average expense of repairing highways in the neighbourhood," and it may be useful to consider some of the more important judicial decisions and dicta with reference to the certificate in general, and this clause in particular. To take first a preliminary point: Is it necessary, in order to make the certificate valid, that it should be signed by the permanent surveyor of the highway authority properly appointed, or will it suffice if it is signed by a person who has acted as surveyor *de facto?* In the case of a Highway Board the latter was held to be sufficient, and the same rule would seem to be applicable to rural district councils who are successors of Highway Boards. There is no actual decision, however, applying the rule to district councils, urban or rural, and the prudent course, therefore, would seem to be that the certificate should be given by the duly appointed permanent surveyor. Next as to the contents of the certificate. It is apparently not enough for the surveyor to state the bald fact that extraordinary expenses have been incurred; he must set out the facts in sufficient detail to enable the highway authority to say that "it appears to them" that such is the case, and to satisfy themselves that the expense of repairing the damaged road was substantially higher than the expense incurred in respect of a like length of similar roads. And if it should be asked "Why *similar* roads?" (since the adjective is not to be found in the section) the answer is that this is an inference deduced from the judgments in the case of *Billericay Rural District Council* v. *Poplar Union* (1911, 2 K.B., 801), in which the Court expressed the opinion that the highways to be regarded are those which are in their nature fairly comparable. For instance, if it is a country lane that has been damaged, the highways taken into account in calculating the average should not include roads made up to carry heavy traffic, and *vice versâ*. In the rare event of there being no comparable highways in the district, neighbouring districts must be resorted to for the purpose of the necessary comparison.

Another important question which arose in the Billericay case was this: Assuming that the surveyor has given his certificate after duly taking into account the average expense of repairing other highways (in accordance with the foregoing principles), is this conclusive, or must the highway authority be prepared, at the trial of the case, to prove the amount of such average expense by specific evidence? In some earlier cases the Court held that the certificate was conclusive in this respect; but in the Billericay case the highway authority were worsted, and failed to recover for the very reason that no evidence of this "average expense" was forthcoming at the trial, and the Court of Appeal upheld this decision. The opinion expressed by two of the Lords Justices in their judgments in that Court is highly important. In their view the average expense of repair of neighbouring highways is not merely an element to be taken into account, but is the basis of calculation, the sum recoverable being the difference between the actual cost of repairing the damaged highway during the period in question and the average cost during a similar period of repairing an equal length of road of the same class. It may possibly be thought by some that in their interpretation of the rather vague language of the Act the Courts have practically put words into the section which are not there; but so long as these decisions remain unchallenged it is obvious that it will conduce to the successful prosecution of claims for extraordinary traffic expenses for highway authorities to adopt a system of accounts which will enable them to show the expense of repairing the various roads, or sections of roads, in their district during any given period. Such a system will also greatly facilitate the preparation of the all-important surveyor's certificate.

* * *

Liquid Chlorine for Water Treatment.

American practice in water treatment shows the growing use of liquid chlorine as a sterilising agent in place of hypochlorite. Whether it will supersede hypochlorite generally, as it has done in the case of Bubbly Creek, Chicago, is a matter of some interest. Mr. C. A. Jennings, the superintendent of the works, recently stated in a paper presented to the Illinois section of the American Waterworks Association that, as the result of one month's working at Bubbly Creek, it was clear that there was a great advantage in the use of liquid chlorine as compared with the hypochlorite treatment previously in use. With liquid chlorine there was less labour, greater rapidity of working, no loss or deterioration of chlorine, no unpleasant odour about the plant, and last, but not least, a considerable saving of expense. It is the last item which will probably be of the greatest interest, seeing that the efficiency of the best hypochlorite plants leaves little to be desired.

It must be remembered that the conditions at Bubbly Creek are peculiar. The water is of a nature that requires a very large dose of sterilising agent. The average dose of chloride of lime was 55 lb. per 1,000,000 gallons, or approximately 5·5 parts of available chlorine per 1,000,000, whereas about one-tenth of this dose suffices in many cases, and the average dose in America is about 1 part per 1,000,000. The means for getting into solution all the hypochlorites used at Bubbly Creek are known to be very poor. There were, moreover, other shortcomings, and although this was one of the earliest instances of a water supply being sterilised by means of hypochlorites, it was by no means worked on the best and most economical principles. Thus when liquid chlorine was applied, the regulation of the germicide being much more simple and accurate than was possible in the case of the old hypochlorite plant, a considerable saving of expense was effected, the relative costs being as 1 to 3 for a month's working. It is very improbable that a saving of this kind can be made where an efficient plant for the application of hypochlorite exists. However, it is to be gathered that the advantages of liquid chlorine are appreciated elsewhere. Mr. Francis F. Langley, of the staff of Messrs. Hazen, Whipple & Fuller, of New York, in a paper read recently before the American Waterworks Association, discusses the question.

Out of 110 replies received to inquiries from authorities representing water supplies of 2,000,000,000 gallons daily, it was found that in 80 per cent of the cases hypochlorite was used, and in 20 per cent liquid chlorine. It is clear from the replies received that the application of the sterilising agent is not always carried out in a scientific manner or in a reasonable manner. In America the water is generally of such a character as to need settlement, coagulation, or filtration before the dose is added; but it appears that in many cases the sterilising agent is added to water which, owing to the amount of organic

matter in suspension is quite unsuitable for treatment. We read also of such things as wooden tanks, where considerable proportion of the hypochlorite is taken up in the structure of the wood. About 37 per cent of the cities use disinfection without other treatment, although 95 per cent of the plants in question [illegible] water from rivers and lakes. Moreover, 17 per cent of the cities applied the disinfectant before coagulation. More than 20 per cent of the hypochlorite tanks are of unlined wood. We are told also that the works differ widely in design, and that some of the most modern plants [illegible] per 1,000,000 gallons; similarly the working costs differ widely. [illegible] to arrive at any definite conclusions as to the relative economy of liquid chlorine when compared with hypochlorite. All that we can gather is that liquid chlorine is being used, and that apparently it possesses certain advantages. The possible shortcomings of the process have been discussed already in these pages, and these should also be remembered.

* * *

The Port of Liverpool.

In addressing the members of the Liverpool Engineering Society recently on the "Improvement of Local Means of Communication," Mr. John A. Brodie, the city engineer, had a good deal to say which was of more than local interest. We make no apology therefore for referring to a paper which [illegible] concern the general body of municipal engineers. In taking a broad and [illegible] problems under consideration, Mr. Brodie was more than once led to the conclusion that one of the greatest impediments to their solution is the multiplicity of authorities, and the arbitrary manner in which the boundaries between the several districts have been fixed. As an example of the waste which may result from the lack of reasonable co-operation, he cited the case of the outfall sewer to take the sewage of West Derby and Walton through those districts and Bootle to the river, first proposed over fifty years ago, and now being carried out, although in the meantime an expenditure of something like £150,000 on sewage farms and separate outfalls leading to them has been entailed, to a large extent uselessly, when looked at from the point of view of present efficiency. In considering the question of the provision of suitable main lines of communication between the central business areas of the city and the outlying districts, Mr. Brodie insisted upon the vital necessity of making these thoroughfares of adequate width. In these days, having regard to the increasing volume of fast traffic, wide roads are required more than ever before, and the wise engineer, in designing main roads through unbuilt districts, will err on the side of generosity in this respect, and so save the enormous cost of future improvements. It may safely be asserted that, on the whole, the city of Liverpool has been developed with considerably more foresight than most towns, and yet during the past fifty years she has expended over £5,000,000 sterling on street improvements.

One of the most interesting parts of Mr. Brodie's paper was that which dealt with the respective prospects of the motor omnibus and the tramway as competitors for public favour. He did not incline to the view that the day of the tramway is past, but was of opinion that an improved tramway will probably continue to hold its own wherever sufficient width is provided to enable the vehicles to travel at a high rate of speed with comfort and safety to the passengers, and without causing a nuisance by noise or vibration to the frontagers. As a practical method of overcoming the nuisance from noise, Mr. Brodie suggested the use of rubber or resilient tyres, and pointed out that it is only by this means that the fast-speed motor omnibus has been successfully placed on the road. The extra cost of rubber tyres may be an objection, but it should be remembered that we are now running motor wagons which, complete with load, are equal in weight to that of a loaded tramcar, and that there is no difficulty in getting satisfactory guarantees of mileage on a 10,000 miles basis, while most of them give a life much greater. It is likely also that the total cost of running tramcars at 20 miles per hour will be lower than at 8 miles per hour, as the proportion of the first cost of the car will be less, and the [illegible] conductor will be spread over more than double the daily car mileage. The cost of current will, of course, be increased, as may also be the cost of repairs, but neither of these charges will increase in the same proportion as the car mileage. Great advantage in economy will also be found from the lower cost of upkeep of the permanent way, and the saving on this head alone may more than compensate for the additional cost of upkeep of resilient tyres, while the change in the tyres may, as in the case of motor wagons, repay itself in [illegible] vehicle.

* * *

The Engineer as Publicist.

In order that the status of the engineering profession—and particularly that of municipal engineers—may be improved, the first necessity is that the general public may be educated up to something like a true appreciation of their work. One method by which this [illegible] *Engineering Record* suggests, the publication of reports in such a form as will interest the general reader. Indeed, it may be said that in the preparation of an annual report three objects should be kept in view. First, a broad survey should be given of the leading features of the year's work, as far as possible in non-technical language, and so arranged as to be capable of easy assimilation by the members of the local authority—the vast majority of whom are laymen in regard to engineering matters—and the public at large. Next, the report should contain such details and data of a technical character as will render the report of value to other engineers and suitable for exchange. Finally, there may be an appendix of purely statistical details suitable for office reference and intended primarily for that purpose. In other words the annual report should be the medium through which the engineer keeps himself in touch with his authority, the ratepayers of his district, and his professional brethren. The suggestion is made that copies of the introductory part of the report should be sent to the local newspapers, and there is a good deal to be said for such an idea. We fear, however, that the innate modesty of most British engineers will prevent them from doing more than is absolutely necessary to give publicity to their work.

* * *

A Chair of Civic Design.

It will have been seen from the advertisement in our issue of March 26th (p. 154) that the council of the University of Liverpool are inviting applications for a Professorship of Civic Design—a course which should be widely welcomed. The successful candidate will be responsible "for the conduct and direction of research into the problems connected with the design and development of towns, such research being held to include the production of drawings of schemes for the treatment of specific problems, as well as critical and historic surveys of existing work." So interesting and practical are the possibilities this suggests that, for the information of those qualified for candidature, we give elsewhere full details as to the appointment.

Disposal of Liquid Wastes from Manufacturing Processes.

SEWAGE COMMISSION'S RECOMMENDATIONS IN NINTH REPORT.

[The Ninth Report of the Royal Commission on Sewage Disposal, which made a simultaneous appearance last week with the Final Report, deals (1) with the discharge of manufacturing wastes which for any reason cannot be taken into sewers, and (2) with the disposal of domestic refuse in rural areas. Full extracts from the Report—the commissioners' own summary of which appeared in last week's Surveyor—are appended.]

The trades or manufacturing processes with which we are concerned require the use of water in considerable quantity, and the problem with which we have to deal is the proper treatment or disposal of the water after use. In some cases, such as in tin mining or stone quarrying, the water is used merely as a mechanical carrier, with the result that, apart from the addition of much suspended matter, its quality is not materially affected. In other cases, where it is used as a solvent, as, for instance, in wool washing, the dissolved impurities are very great, and the water is rendered far more foul and polluting than strong domestic sewage. Again, other manufacturing processes give rise to liquid wastes which are highly objectionable on account of the corroding or poisonous nature of the chemicals which they contain.

The character of the waste liquor varies with each trade, and frequently with different branches of the same trade, but, speaking generally, it may be said that liquid trade waste is of a highly objectionable and polluting nature. As regards the quantity, it is to be observed that in the manufacturing districts the volume of waste liquor discharged from a single factory during a working day of ten to fourteen hours may amount to as much as 500,000 gallons, equivalent to the daily volume of domestic sewage of a town with a population of about 17,000 persons.

These general facts and the filthy state of many rivers and streams in the manufacturing districts show clearly the necessity for laws regulating the purification or disposal of liquid trade wastes.

DISCHARGE INTO SEWERS RECOMMENDED WHERE PRACTICABLE.

As we pointed out in our Third Report, the most effective, as well as most economical, means of protecting our rivers from damage due to the discharge of trade liquids is the treatment of these liquids, when practicable, at the sewage works of the local authority, and we accordingly recommended that the law should be altered so as to give manufacturers the right to discharge their waste liquors into the sewers, subject to certain conditions. We desire to repeat and emphasise this recommendation, which was in the following terms:—

"22. We are therefore of opinion that the law should be altered so as to make it the duty of the local authority to provide such sewers as are necessary to carry trade effluents as well as domestic sewage, and that the manufacturer should be given the right, subject to the observance of certain safeguards, to discharge trade effluents into the sewers of the local authority if he wishes to do so. We do not think it possible to provide by direct enactment what these safeguards should be. In each district it would probably be desirable that the local authority should frame regulations which should be subject to confirmation by a central authority. In most cases, however, these regulations could provide definite standards for the different manufacturers as regards preliminary treatment, and it appears from the evidence that the manufacturers would much prefer to have standards to work to. Power to vary the standards or to dispense with them altogether in special cases would be necessary.

"23. Although the duty of receiving trade effluents should, we think, be imposed on the local authority, cases may arise in which they should be wholly or partially relieved of it. For example, we find that in some instances the effluent discharged from the manufactory is of a composite character, the greater part of which might with advantage be easily dealt with by the manufacturer if it were kept separate. In such cases we think the manufacturer would generally be willing to adopt this course, but provision is necessary for those cases in which the local authority and manufacturer could not agree. Further, although we have received no conclusive evidence to show that there are trade effluents which could not be purified by the local authority, we do not deny the possibility of such cases arising. And it is possible that in some cases, as, for example, of a large manufactory being newly established in a small district, it might be necessary to relieve the authority of the obligation to treat the trade effluent or to enable them to exact some special contribution from the manufacturer, not only for the cost of treatment, but also towards capital expenditure.

"24. It is obvious, therefore, that some tribunal will be required for settling the differences between the local authority and the manufacturer, and for relieving the local authority in exceptional cases, either wholly or partially, of their obligation to provide sewers and disposal works of sufficient capacity for trade effluents as well as ordinary sewage."

GENERAL LEGISLATION REQUIRED.

Unfortunately, effect has not yet been given to these recommendations. Most of the larger local authorities do, in fact, receive into their sewers a large number of trade effluents of small volume without conditions, and in some cases on special conditions; and this policy has been useful in assisting the trades of their districts without materially increasing the difficulties of sewage treatment.

On the other hand, most small authorities show considerable reluctance to receive trade effluents into their sewers at all. We think that this reluctance may be partly due to the fact that in many cases the cost to the local authority of treating trade effluents is considerably in excess of the amount received in sewage rates from the traders; indeed, we have had evidence of cases in which the cost of treatment exceeds the rates paid by the traders for all purposes. In our Third Report we recommended that traders discharging into sewers should if possible comply with certain conditions as to preliminary treatment which would facilitate the final treatment of their effluents, but that no special charge should be made upon them unless for any reason they were unable to comply with those conditions. We added, however, that "power should also be granted to make a special charge even when preliminary treatment is adopted, when there are exceptional circumstances as regards volume, quality, or otherwise."

Since the issue of that report in 1903 a few local authorities have, in the absence of general legislation, obtained powers under local Acts for dealing with trade effluents. In these Acts power is given to the local authority to make a charge upon the trader when the regulations in regard to preliminary treatment, control of flow, &c., are not complied with, or where there are such exceptional circumstances as are indicated above. In one of the Acts, however, the power to charge is not so restricted. Our own additional experience and the further evidence which has been laid before us indicate that it may be desirable that local authorities should have a general power to make a charge, provided that the charges were lower in the case of effluents which had been subjected to preliminary treatment in accordance with the regulations. As we recommended in our Third Report any such charges should be fixed by agreement between the manufacturer and the local authority—or in default of agreement by the Rivers Boards, subject to appeal by either party to the central authority. Further, we would repeat our recommendation that the power to make a charge should extend to cases in which connection with the sewers already exists, subject to the terms of any agreement under which a manufacturer may have purchased the right to discharge his trade effluent into a sewer.

But, notwithstanding a general extension of the system under which purification of trade wastes is undertaken by local authorities, there will remain many cases in which manufacturers must remain responsible for the 'treatment' of their own 'trade-

[illegible] quiring further time and experiment for the elucidation [illegible] only indicate the lines on which, in our opinion, the appropriate solutions should be sought.

[illegible] river or trade, we have undertaken special experiments [illegible] all liquid trade wastes would involve prolonged [illegible] we have repeatedly recommended.

It is unlikely, in most cases, that manufacturers will be able or willing themselves to undertake the scientific investigations which are required in order to discover the best means of rendering harmless the liquids which are produced by their particular trade. As the law stands, indeed, it is not to their interest to do so, seeing that, under sec. 6 of the Rivers Pollution Prevention Act, 1876, proceedings cannot be taken against manufacturers unless the Local Government Board are satisfied, *inter alia*, that "means for rendering harmless the poisonous, noxious or polluting liquids proceeding from the processes of such manufacturers are reasonably practicable and available under all the circumstances of the case." Hence, in the case of manufacturing waste of which no practicable means of treatment are known, the manufacturer is at pains to discover such means as will no doubt confer a benefit on the community, but in so doing will render, both himself and others connected with the same trade liable not only to the expense of constructing purification works, but also to the risk of proceedings from which they would otherwise be exempt.

It is true that in some cases a manufacturer may, by adopting means of purification, derive direct and material advantage from his expenditure. Thus, when water has to be purchased, the treatment of his liquid waste may render it suitable for further use as water in the process of manufacture, and so lead to substantial economies. Or, again, treatment of waste [illegible] proportion of the material which it is the primary object of the industry to secure, or of separate by-products which have a commercial value. Thus, in the dyeing industry the effluent, after purification, can frequently be used again with advantage and economy; at tin mines and china-clay works considerable quantities of the minerals are obtained from further treatment of the washing waters; in various woollen industries the recovery of grease may recoup a part, or even the whole, of the cost of purification; while by some coal-washing processes both loss of coal and waste [illegible] are prevented. At the same time, it has to be borne in mind that the interests of manufacture are not the only consideration on which the demand for improvement rests. To most this demand some stimulus other than prospect of profit will be required.

DISTINCTION BETWEEN INDUSTRIAL AND OTHER DISTRICTS.

By sec. 6 of the Rivers Pollution Act, to which we have referred above, it is provided that the Local Government Board "... shall not give their consent to proceedings by the sanitary authority of any district which is the seat of any manufacturing industry unless they are satisfied ... that no material injury will be inflicted by such proceedings on the interests of such industry."

From the principle embodied in this enactment we do not dissent. In the special investigations which we have conducted we have considered the question of cost from this point of view, and we think that the primary object of future experiments to be carried out by the central authority should be to show, not that purification can be carried out with profit or without loss to the manufacturer, but that the cost should not be so great as to inflict material injury upon the industry.

[illegible] preamble [illegible] quoted above—"in any district which is the seat of any manufacturing industry." These words are important, as indicating that in industrial centres the special interests of manufacturers should be regarded with an indulgence which they would not receive in other places. The framers of the Act of 1876 recognised that in such centres the interests of the community are largely bound up with the interests of the manufacturers, and that to demand from manufacturers costly schemes of purification might injure the community without securing any corresponding improvement in the character of their river, which was already materially, if not hopelessly, impaired by its environment. On the other hand, it would be clearly inequitable if in a sparsely populated district a manufacturer, with a view to obtaining free of charge a supply of clean water, were to set up his [illegible] entitled to discharge polluting liquids into the stream on the ground that the cost of purification works would inflict material injury upon his industry.

[illegible]

We may, however, point out that this distinction between industrial and other districts, while it is intended to prevent the extension of industrial pollution to fresh districts, may also tend to perpetuate the conditions which prevail in manufacturing centres. The problem presented by the rivers which flow through such centres has become so complex and of such large dimensions that, under present conditions, measures of purification can be expected to do little more than act as a palliative of the grosser forms of pollution. The cost of such measures is felt, but their benefits are negative rather than positive in character. It is necessary that means of purification should at once be more efficient and more generally enforced if their cost is to be compensated by material advantages.

For example, the advantage to a riparian manufacturer of being able to obtain clean water from the river is obvious; but, owing in great measure to the difficulty of administering the existing law, the condition of many rivers is such that their water is valueless for manufacturing purposes, and the prospect of restoring by remedial measures any serviceable degree of purity to such rivers must needs appear so remote as to deter manufacturers from spending more money than they are compelled on purification works which are of no direct benefit to themselves, and of scarcely appreciable benefit to others. But if a more efficient, albeit perhaps more costly, system were in force, manufacturers would be able to save large sums which they are now compelled to spend in obtaining clean water, and would thus have a direct interest in securing the purity of their common source of supply.

In a district which is not the seat of a manufacturing industry we have said that the present law is intended to prevent the extension of industrial pollution. We do not find, however, that the operation of the law has proved efficient in this regard. In such districts there are various interests which, in our opinion, need further protection. Apart from considerations of public health, the interests of fishing and of agriculture, as well as the amenities of the river are liable to be adversely affected by pollution. We think it right to draw special attention to the protection of fishing, both in tidal and non-tidal waters, not only because in many cases it is an important industry, but because it is peculiarly liable to serious injury from pollutions which, under present conditions, neither those concerned in the industry nor the authorities who are charged with the duty of dealing with pollution have adequate power to prevent.

FISHERIES.

In our Third Report we made further recommendations in regard to the formation of Rivers or Watershed Boards throughout the country, and in our Fourth Report, which dealt more particularly with tidal waters, we recommended that the necessary power of action over the pollution of such waters should be vested in the Rivers Boards, and that Sea Fisheries Committees should be empowered to appoint one or more representatives on River Boards having tidal waters under their jurisdiction. We also supported generally the view of the Salmon Fisheries Commission that, if practicable, the powers of Salmon Conservators and other similar bodies

should be transferred to the Rivers Boards. In that event the duty of protecting fisheries should be expressly imposed on the Rivers Boards, who should be armed with such extended powers as may be necessary to deal with pollution in the interest of fishing as well as in the interests of public health.

We desire to repeat and emphasise the recommendation that fishery interests, whether in tidal or inland waters, should be represented on the Rivers Boards having control over such waters. In districts where it may not be necessary that a Rivers Board should be set up, we think that the county council should be clothed with any powers necessary for carrying out the duties of a Rivers Board, including the power to co-opt representatives of the various fishing interests.

We think, then, that both in industrial and other districts legislation can do much to reduce or prevent the pollution of rivers. The main objects of such legislation should be to secure—(1) more general reception of trade effluents into sewers, (2) improved supervision of rivers, and (3) prosecution of scientific research.

With the first of these objects we are not at the moment concerned. We have dealt with the subject at length in our Third Report, and we only refer to it here for the sake of emphasising our opinion that if the bulk of trade effluents were received into sewers, the magnitude of the problem would be so greatly reduced that a valuable incentive would be suppled for attacking the remaining difficulties.

In the same report we have considered the machinery by which improved supervision of our rivers could be secured—viz., the formation of Rivers Boards throughout the country, acting under a central authority; and in a later section of the present report we shall indicate in greater detail what should be the functions of those bodies in relation to the discharge of manufacturing wastes directly into streams.

RESEARCH BY CENTRAL AUTHORITY.

As regards scientific research, we would urge that the investigations which have been instituted by river authorities, by private individuals, and in some cases by ourselves, should be continued and extended by the central authority, whose constitution we have repeatedly recommended. We have already suggested that the staff of the central authority should include a chemist, an engineer, and a bacteriologist, all with special qualifications, and that it should be equipped with a laboratory; and we think that the function of discovering the most efficient and economical means of treating the different classes of trade liquids would form a most important branch of the duties of such an authority.

The problems to be solved are very largely financial. It must be admitted that thorough purification of liquid trade waste is frequently very costly, and that if it were enforced upon all manufacturers indiscriminately in the present state of our knowledge a vast sum of money might be expended without commensurate benefit to rivers. Large sums of money have already been spent in this way, and although the expenditure has improved the condition of rivers, we cannot help noticing that substantial amounts have been wasted through want of technical knowledge. For example, large settling tanks have had to be erected at some works owing to the wasteful and unscientific method of washing adopted. The same cleansing effect could frequently be produced with a much smaller volume of water, with a consequent saving, apart from economy of water, in the expense of constructing settling tanks.

To pave the way for further investigations we have made a general preliminary survey of the ground to be covered, and have indicated, where possible, the lines on which we think advance should be essayed. To this end we have made some inquiry into the character of the different trade effluents. We have caused average samples to be drawn and analysed by our officers, who have also carried out purification experiments on a laboratory scale with certain trade effluents, and on a large scale with two or three others. The results are given in later sections of this report, but we may make some general remarks as regards their material bearing.

GENERAL CHARACTERISTICS OF TRADE EFFLUENTS.

They show that all the more important trade wastes are liquors which contain a very considerable quantity of suspended matter, and most of them take up a large amount of oxygen when submitted to the "five days dissolved oxygen absorption" test.

We have made no experiments ourselves, and we know of none made by others, which show that the polluting power of a trade liquor of given oxygen-absorbing strength is equal to that of a domestic sewage liquor of the same oxygen-absorbing strength.

Probably the effect of the discharge of not a few trade liquors into a river differs somewhat from the discharge of domestic sewage, for their rate of absorption of oxygen may be very slow to begin with, being delayed, no doubt, by the inhibitory action of some substances in solution, and may only reach its maximum in two or three days, while with most sewages and sewage liquors the maximum rate of oxygen absorption is reached within twenty-four hours. On the other hand, there are trade wastes which closely resemble sewage as regards the rate at which they take up oxygen from water, some, indeed, which would have a more immediate effect of this kind on the river.

There are, too, certain trade wastes whose organic matter is mainly carbonaceous, which may take up oxygen from water rather rapidly without giving rise to nuisance from smell when the oxygen becomes exhausted, or nearly so.

Again, the quantity of nitrogen contained in many trade liquors is relatively small, and as other plant food constituents, such as phosphorus and potash, are doubtless present only in minute quantities, if at all, it follows that such trade liquors are unlikely to cause excessive vegetable growths of any kind in rivers. Indeed, seeing that they sometimes contain certain poisonous substances, they may destroy or inhibit vegetation in rivers, and so diminish important self-purification agencies. The poisoning of aquatic insects, worms, or of other forms of animal life, &c., is another very important effect which must be borne in mind, especially in relation to fish life.

Many trade liquors, moreover, are strongly coloured, or acid, or alkaline, or they are excessively "hard," and in such cases they may very materially impair the quality of the river water for manufacturing purposes.

Certain classes of trade liquors would have to be purified to something like the same extent as a domestic sewage if nuisance was not to be caused in the stream receiving them; and, in addition to this, they would have to comply with standards for "acidity," "alkalinity," "hardness," and poisonous metals. In other words, they would require not only full biological treatment, but special preliminary treatment in addition.

SUFFICIENT PURIFICATION NOT YET POSSIBLE IN SOME CASES.

It is practicable to purify at reasonable cost some trade waste liquors to an extent sufficient to prevent injury to the stream, but as regards others we know of no examples showing that this is possible in the present state of our knowledge.

Before making any suggestions as to the extent to which we think purification should be carried in any particular case, we proceed to give a detailed account of the chief trade processes with which our inquiry is concerned, of the liquid wastes which are caused by these processes, and of the measures which have been or could be adopted for purifying the wastes before their discharge into streams.

We think it important to make it clear that the examples of purification works cited comprised the best that we could find after consultation with the Rivers Board or county council concerned. In each case we satisfied ourselves, before drawing our own samples, that the plant was being worked with proper care and under normal conditions.

GROUPS OF TRADE WASTES.

We propose to classify these liquid wastes in three groups, as follows:—

(1) Those which are polluting by reason of the suspended matter which they carry with them.

(2) Those which are polluting mainly because of the suspended matter which they carry with them, but also to a considerable extent because of the dissolved impurities which they contain.

(3) Those which are polluting mainly because of the dissolved impurities which they contain.

[Here follows a detailed account of the more important trade processes producing waste liquids, together with a consideration of the means available for their purification.]

GENERAL SUMMARY AND CONCLUSIONS.

We [illegible] the information which [illegible] to [illegible] to the best advantage [illegible] it proper to give some fuller consideration to the questions arising out of our inquiry, with a view to suggesting improvements in administration and amendments of the existing law.

[The commission is directed with the existing law in regard to manufacturing pollution, setting out the main principles embodied in the Rivers Pollution Prevention Act, 1876. The Act, they point out, deals separately with mining pollution, but on generally similar lines.]

DEFECTS OF THE EXISTING LAW.

From a study of the provisions [illegible] evidence which has been [illegible] to the operation we have come to the conclusion that in one main respect [illegible] one hand they provide facilities for escaping the consequences of the commission of an offence; on the other hand, they do little to assist manufacturers who are anxious to avoid the offence itself.

[illegible] and inherent in the principle on which the law is conceived. If we leave [illegible] in regard to channels existing at the date of the Act [illegible] its retrospective operation—and the similar provisions in regard to mining pollution, we see that the law makes a prohibition with which most manufacturers could only comply to the letter by closing their works. In [illegible] means of securing that no poisonous, noxious or polluting liquid whatever is discharged into the stream. The law does not say that a manufacturer who is using the best practicable means of treatment is not committing an offence; it merely provides him with means for escaping prosecution.

The commission of a technical offence being practically inevitable, it was clearly judged necessary that some safeguards should be provided to protect the manufacturer who does his best to avoid committing an actual offence. These safeguards are, as we have seen, sufficiently elaborate. The prosecuting authority must obtain the consent of the Local Government Board, who are bound, before giving it, to be satisfied on various points. When that consent has been obtained, the authority must give two months' notice before proceeding, and in the meantime the manufacturer may demand that the authority shall hear his objections and decide upon them in a more or less judicial capacity; and, finally, the court might find, on expert advice, that any effective order would be impracticable on the ground of expense.

This prolonged procedure affords ample opportunities for evasion to an actual offender. On the other hand, it gives little or no guidance to the manufacturer who is ready to avoid causing pollution, but is ignorant of the best means of doing so; nor does it give him any security that, when he has constructed works to comply with present demands, he will not be compelled thereafter to comply at short notice with further and more stringent demands.

We do not suggest that the authorities who are empowered to enforce the Rivers Pollution Acts are in the habit of pressing their provisions unduly, but we do suggest that it is desirable to secure that a manufacturer shall know with what degree of purification the authorities will be satisfied, and for how long they will be satisfied with that degree.

We think that a good deal could be effected in this direction by a simple alteration. . . . It is to be observed as a rather curious feature of the Act of 1876 that, whereas the Local Government Board are required to have positive knowledge of industrial and local requirements, their functions are of a merely negative character. They may be compared in this respect to a Grand Jury: they can stop further proceedings; but when once they have given their consent to proceedings being taken the matter passes out of their hands. Thus their knowledge of the local conditions is not available at the time when it is most required—that is, when it has to be decided by the court what particular steps are necessary to prevent a recurrence of the offence.

It appears to us to be a not unreasonable proposition that, if the Local Government Board are the body best qualified to decide on the merits of a particular case in which proceedings are to be taken, they are [illegible] should be taken if the proceedings are successful.

The considerations which, under present conditions, are to guide the Local Government Board in the first instance are, broadly speaking, the same as those which are to guide experts to whom the case may be referred by the County Court in the last instance; but, whereas a central authority may be expected to observe a uniform principle in their decisions, the various County Courts and the various experts might well hold widely divergent views of local and industrial requirements. We suggest, therefore, that procedure would be at once shortened, simplified, and made more uniform if some alterations in the law were made. We think that these alterations might be designed so as to provide:—

(1) That, before proceedings are taken against a manufacturer, the Rivers Board or sanitary authority should specify the degree of purification which they [illegible]

(2) That the manufacturer should have the right of appeal to the central authority against those requirements;

(3) That the requirements [illegible] by the manufacturer or settled by the central authority, should remain in force for a definite term of years; and

(4) That, [illegible] ment of the requirements, any matters at issue (other than questions of law) should be referred by the court to the central authority.

[illegible]

We think that such alterations as we have indicated in regard to procedure would be effective in obtaining both a greater measure of security for the manufacturer and a greater measure of uniformity in administration; but further advance in both directions is, in our view, desirable. The discretion which would be given to the central authority by our proposals would doubtless be exercised within more definite limits than the discretion which is now given to the different County Courts and the expert advisers whom they may consult. But it would strengthen the hands of the central authority, and at the same time be more satisfactory both to the prosecuting authorities and to the manufacturers if general rules in regard to the degree of purification to be demanded as regards various trade wastes could be formulated and published. It is further desirable that such rules should have the force of law binding on the courts. Unless these rules were made statutory they might have little effect. For example, if a sanitary authority were to obtain the necessary consent and take proceedings on the ground that the agreed or approved requirements were not being fulfilled, the court might find that, whether those requirements were in fact being fulfilled or not, an offence against the Rivers Pollution Act was being committed, and might make an order which had no reference to such requirements. To obviate this result it is necessary that offences against the Act should be further defined, and this could best be done by reference to a standard or system of standards, provision being made to the effect that the discharge of a trade effluent which complied with the appropriate standard of purity should not be an offence against the Act.

THE PRACTICABILITY [illegible] AND STANDARDS [illegible] TRADE EFFLUENTS.

In regard to the purification of domestic sewage by local authorities, we advocated in our Eighth Report a single standard which could be modified in various local circumstances. We have now to consider whether and to what extent the principles which we laid down in regard to sewage can be made to apply to trade effluents, having regard to certain differences which exist in the character of sewage and of trade effluents, and in the conditions under which they are respectively discharged.

Differences in Character of Sewage and Trade Effluents.

The several classes of trade waste show *inter se* much greater differences of character than do the various types of sewage liquids. Indeed, as compared with trade wastes, sewage liquids may be regarded as more or less homogeneous, and from this point of view sewage pollution is but a single species of pollution—each kind of waste appearing as a parallel but quite distinct species. Hence it would be unsafe to assume that measures which are applicable to the regulation or prevention of sewage pollution are neces-

sarily applicable to the case of trade pollution, or to legislate for trade pollution generally without distinguishing between the different conditions affecting different trades.

The scheme of standards which we recommended for sewage liquids was based upon prolonged and extensive observation of the effects which various sewage liquids of known composition and volume had upon various streams of known character and volume. By carrying out experiments and observations under a great variety of local conditions we aimed at eliminating or discounting irrelevant factors, and isolating, as far as possible, the effects which are directly attributable to the discharge of the sewage liquids under review. Before we could recommend, with equal confidence, a similar scheme of graduated standards for trade effluents, we should need to investigate the different effects produced under different local conditions by each class of trade waste. So extensive an inquiry we have been unable at the time at our disposal to attempt. It must be remembered, too, that no single kind of trade liquid is discharged under so great a variety of local conditions as is sewage, and that in industrial districts, where the question of trade pollution is most serious, it frequently happens that different trade liquids are discharged at such short intervals and are so intermingled that separate estimation of their effects is impracticable.

Different Effects of Sewage and Trade Pollutions upon Fish Life.

We find that, speaking generally, manufacturing pollutions are apt to be more injurious to fish life than is sewage pollution. The effect upon fish of a discharge of sewage liquor is produced in the main not directly, but through the de-oxygenation of the water, owing to decomposition of organic constituents of the liquor. Trade liquids, on the other hand, may not only de-oxygenate the water, but they may contain constituents which are directly poisonous to fish. The Royal Commission on Salmon Fisheries reported in 1902 that:—

"Many manufactories discharge substances which are directly toxic. Among these are the chlorine from bleaching works, paper works, &c., the acids from steel works and tin-plating works, the alkalis from wool washings, the gas lime, cyanides and carbolic acid from gasworks, and the organic acid in the pot ale of distilleries. . . .

"The fine detritus of coal washings may act as an irritant to the gills of the fish, and by forming a deposit in the river bed prevents the free passage of oxygen to the ova."

We agree with this statement, and we find also that some trade liquids contain mineral poisons, such as arsenic, lead and zinc, which are undoubtedly harmful to fish. For example, we have found the following amounts present (in parts per 100,000):—

In six dye and bleach works effluents	0·01 to 0·26	arsenic (As)
In two chrome tannery effluents	0·38 and 2·13	"
In a brook water above a print and dye works ...	0·02	"
In a brook water below a print and dye works ...	0·07	"
In a brook water near a works manufacturing arsenical products ...	7·6	"
In a dye and bleach works effluent	0·21	lead (Pb)
In a lead mine effluent ...	·66	zinc (Zn).

We are unable to say what would constitute a toxic dose of any of these substances; our evidence shows that further investigation is needed into the effect upon fish of different mineral poisons. While dilution with comparatively clean water may be relied on to prevent injurious de-oxygenation, we have no information showing to what extent such dilution would be a safeguard against the effect of poisonous substances.

In the present state of our knowledge, therefore, we do not think it possible to found a scheme of graduated standards for each class of trade effluent on any adequate basis of observation, and experiment in regard to the effect of trade pollutions on streams.

Differences in regard to Methods of Treatment of Sewage and Trade Refuse.

For sewage liquids there are several known methods of treatment by a selection or combination of which the required degree of purification may be obtained. For many trade wastes, on the other hand, only one method of treatment is known or needed; for others there may be available two or three processes, each producing somewhat similar results, while in other cases no means of treatment are at present known which could be made efficient at any reasonable cost.

From this point of view graduation of standards for each class of trade waste seems neither necessary nor desirable.

Differences in General Conditions Affecting the Discharge of Sewage and Trade Wastes.

There is, moreover, a broader distinction between sewage and trade discharges which should have some bearing on the administrative aspects of the question. The discharge of sewage is a public necessity; its proper disposal is a public duty carried out by a public authority at the public expense. Provided that this service is efficient in the sense of preventing injury to the river and to the community, any saving which can be effected on this head is to the direct interest of the community, and should be encouraged on public grounds. On the other hand, the disposal of trade waste by a manufacturer is part of a process which he voluntarily carries on for his own profit. We do not suggest that he should be penalised on this account, but we think it not unreasonable to expect that a trader who uses water from a stream for his own purposes should do what he can towards returning it to the stream in a condition as pure at it was before use, even though, owing to the relative volume of the stream, the discharge of unpurified waste would cause no appreciable injury; nor do we think that a trader who derives his water from other sources could properly complain of a similar requirement, for he is not compelled to discharge into the stream, but only uses it as a convenient method of getting rid of his waste liquids. We hope, however, that in future the difficulty will be solved in the majority of these cases by the reception of the effluents into the sewers of the local authority.

Arguments have been put before us in favour of requiring, as far as is practicable, the same degree of purification from all who are competitors in the same branch of trade. We think it generally desirable to aim at securing uniformity of treatment for those engaged in any given branch of industry rather than at providing for preferential treatment in those cases where merely local conditions would seem to warrant a relaxation of the ordinary requirements.

We are, then, in favour of the principle that any standards which may be prescribed for the purification of trade wastes should be determined rather by the character of the particular trade waste to be treated, and by the means available for treating the particular waste than by the local conditions under which it is discharged. At the same time we have not lost sight of the fact that, under existing conditions, many manufacturers are so placed that they would have much greater difficulty in complying with any given standard than would others engaged in the same industry; in some cases, indeed, owing to want of space or for other reasons, they might find it impossible to comply with the standard. Again, when for any reason it is necessary to preserve a very high degree of purity in a river, a more stringent standard than would be required in normal circumstances might have to be prescribed.

We think that for each branch of industry a single standard of purity should be prescribed by the central authority, and that a departure from that standard should only be permitted if the central authority are satisfied, on the merits of the particular case, that it is necessary in the interests of the manufacturer and the locality.

A SINGLE STANDARD FOR EACH CLASS OF TRADE WASTE.

We have now to consider to what extent it is possible, in the present state of our knowledge, to indicate standards which would be appropriate to each class of trade liquid.

We think it impossible to lay down, as regards each trade, such a standard as would ensure the complete purification of rivers, since, in the present state of knowledge, the attainment of such a standard would, in many cases, be financially impracticable and therefore useless. We have thought it useful, however, to suggest limits of impurity which we believe to be now practicable, and which are based upon careful consideration of the data given in the detailed sections.

These figures will afford guidance to the central authority when established, and, although provisional

and based upon the present condition of knowledge they should, in our opinion, if prescribed, remain in force for a definite period. At the end of this period they would be subject to revision, since admittedly they are inadequate to prevent pollution of streams, and improved methods of treatment may meanwhile have been discovered.

In regard to the periods for which standards for sewage effluents should remain in force we made the following suggestion in our Eighth Report:—

"(52) We think it of importance that a standard once imposed upon a local authority should not be altered until the expiration of a definite period, in order that they may have some security as to the extent of their liability. We suggest that these periods should be prescribed by order of the central authority, and should in the case of the general or any specially stringent standard be not less than ten years from the date when the standard came into operation. In the case of relaxed standards the periods should be shorter. The less elaborate the plant required to meet a standard, the less hardship there will be in reducing the period during which the standard should remain in force; and, on the other hand, it is desirable to offer the local authorities some inducement, in the shape of a more prolonged immunity from interference, to carry purification beyond the minimum. By the end of those periods the central authority should have acquired sufficient experience to enable them to decide whether the general standard required any modification (which we suggest they should be empowered to effect on the joint report of an Officer and also to revise, where necessary, the special standards in particular cases."

We think the central authority might well consider whether a similar principle might not be applied to standards for trade effluents—viz., that in the case of those trades where a standard requiring exceptional purification is prescribed, the period might be longer than in those where only partial purification is required. In either case the period could, of course, be extended if in the meantime no improved methods of treatment had been discovered.

SUGGESTED STANDARDS FOR DIFFERENT KINDS OF TRADE WASTE

We think it important that, in order to simplify administration, the standards to be prescribed for different classes of trade wastes should be uniform with one another as far as practicable. While it is recognised that different trade liquids have widely divergent effects upon streams, and cannot always be judged by the same tests, it has been urged that such common characteristics as they possess should be made amenable to the same standard. Representations have been made to us that in all trade liquids the suspended solids (which may be regarded as common to them all) should be reduced to the same figure.

We are aware that this uniformity of standard cannot produce uniform results, either as regards cost to the manufacturer or as regards the effect upon streams. The separation of solids is a much more costly process in some trade liquids than in others, and this is a consideration which cannot be wholly disregarded. Again, the suspended matters in some trade liquids have a much more deleterious effect than the same quantity of solids in other liquids; but it is obvious that this discrepancy diminishes as the amount of solids allowed to pass into the stream decreases.

The crux of the problem lies in the figure which is selected as the standard. It has been strongly represented to us, on behalf of existing rivers authorities, that this figure should not exceed 4 parts per 100,000 for all trade liquids. We should welcome the imposition of such a standard if we were satisfied that it could be met at reasonable cost. Evidence has been brought before us with a view to showing that suspended solids can be reduced to this degree. But we think it necessary to point out that the procedure which we propose to recommend differs in some important respects from the procedure at present adopted for the enforcement of the Rivers Pollution Prevention Acts. River authorities, under existing conditions, exercise a wide discretion in instituting proceedings under the Acts, and they must needs exercise discretion in the absence of a more definite guide than "the best practicable and reasonably available means." On the other hand, the manufacturer desires to know more definitely what is required of him. This he will gain from the setting up of a standard, but the converse of this proposition is that a standard once set must be rigidly adhered to. We do not suggest as a general rule that prosecution should follow a single infringement of the standard, but we contemplate that in the event of prosecution a single infringement should transfer the burden of proof to the manufacturer. Hence a standard thus rigidly enforced cannot be set at a figure which can only be reached under the most favourable conditions. If a manufacturer is liable to be judged by his worst results he must for his own sake aim at producing average results which are better by a considerable margin than the prescribed standard. It follows that under the system which we contemplate any standard which we may suggest will in practice be much more stringent than would appear at first sight.

It will be seen, then, in the case of most trade liquids under review we propose a standard for suspended solids of 4 parts per 100,000, but in some cases we are prepared to suggest a more stringent a standard, because we are not satisfied that it could be uniformly attained at reasonable cost. We cannot emphasise too strongly, however, that a standard will fail of its results, too stringent a standard will fail in its inception, and the failure will discredit the whole principle of standards which

At the same time it must be borne in mind that our suggestions are far from being intended as a final pronouncement on river purification. We look forward to a time when improved methods will secure generally a still greater measure of purification, and in the meantime we would point out that under the system which we propose it will be open to any rivers authority in specific cases where they are satisfied that a higher degree of purification either attainable, or has in fact been regularly attained, to require a higher degree of purification than we have indicated for particular trades, if they can satisfy the central authority that it is necessary and practicable.

We find that the different trade liquids which we have examined make themselves naturally into the following classes:—

(A) Those for which efficient purification is practicable.

(B) Those for which efficient purification is not in the present state of knowledge practicable.

In Class A we include waste liquids resulting from—

(i.) Coal washing.
Tin mining.
Lead mining.
Chalk washing.
Stone quarrying.
Stone working.
Wood pulp paper works.

(ii.) Brewing.
Malting.
Distilling.
Tin plating.
Galvanising.
Wool drawing.
Shale oil distillation.
Wool scouring.
Tanning.
Leather dressing.
Fellmongering.
Dairying.

In these cases dissolved impurities could also be removed.

In Class B we include waste liquids resulting from—

(i.) Bleaching.
Waste bleaching.
Paper works (except where paper is made from wood pulp only).
Cotton dyeing.
Cotton printing.
Woollen dyeing.
Woollen piece and yarn scouring with dye liquor.

(ii.) Sulphite cellulose manufacture.
Gas and coke production.

Although no practicable means are known for rendering completely harmless the liquids included in this class, nearly all of them can be, and are, considerably improved by clarification.

We have placed sulphite cellulose liquor and spent gas liquor in a separate sub-division because we are not aware of any method of so treating them that

the effluents could properly be discharged into streams.

Class A.

(i.) In this subdivision, as we have pointed out above, reduction to a low figure of the solids in suspension may be regarded as efficient purification, and this can be effected by adequate settlement.

Coal Washing.—We think that the effluent should not contain more than 4 parts of suspended solids per 100,000. In a number of cases this standard might have to be relaxed.

Tin, Lead and Zinc Mines, Chinaclay Works, Slate Quarries, and Stone Polishing Works. Here we suggest provisionally a standard of 6 parts suspended solids per 100,000. So far as our evidence shows, reduction of suspended solids to this extent should obviate danger to cattle or fish from poisoning by lead, tin, antimony or arsenic. There are, however, cases in which no interests other than those of the particular industry are affected by the discharge of the waste waters. If it can be shown—*e.g.*, in the case of small streams near to the sea, which are not used for fishing, for navigation, for watering cattle, or for manufacturing purposes—that no damage is caused by the discharge of waste waters without treatment, we think that the standard might be relaxed or wholly dispensed with.

Paper Mills where Wood Pulp Alone is Used. In this case the effluent should not contain more than 4 parts suspended solids per 100,000.

(ii.) In this sub-division reduction of dissolved as well as suspended impurities is necessary.

Breweries and Maltings.—We suggest that the effluents should contain not more than 4 parts per 100,000 suspended solids, and should take up not more than 4 parts per 100,000 dissolved oxygen in five days.

Distilleries.—For the various methods of treating this waste we refer to our Sixth Report. Since the issue of that report we have kept under observation plants which were erected on the lines which we recommended, and have found them both efficient and economically practicable. We recommend a standard of 3 parts of suspended solids and 2 parts dissolved oxygen absorption in five days. (This corresponds with the general standard which we have suggested for sewage effluents.)

Tin Plating, Galvanising and Wire Drawing. These wastes are strongly acid from mineral acid, and contain much iron in solution. The stronger liquids should not in any circumstances be allowed to discharge into streams. The wash waters should be neutralised and settled. We suggest that the standard for these wash waters should be 6 parts per 100,000 suspended solids. Even after compliance with this standard, a somewhat yellow and colloidal liquid might result. It might possibly have to be softened before discharge, but we do not think it necessary at present to suggest any standard of hardness.

Shale Oil Distillation.—The standards which we suggest are 4 parts per 100,000 suspended solids, and 4 parts per 100,000 dissolved oxygen absorption in five days.

Wool-scouring Liquor.—Though the precipitation liquor obtained by subjecting wool-scouring liquor to direct precipitation is practically free from fat, it remains very strongly organic, and may be regarded as similar to a highly concentrated sewage liquor; and the same may be said of the septic tank liquor from wool suds, which also contains much sulphuretted hydrogen. For this reason we consider that the liquor should be looked upon as a sewage and purified biologically. This treatment has so far only been carried out in the laboratory, but we are of opinion that it is practicable at a reasonable cost, and, subject to our conclusion being verified by experiments on a large scale, we recommend a standard of 4 parts suspended solids and 4 parts dissolved oxygen absorption in five days. Pending such experiments we would suggest for this type of precipitation liquor clarification down to 6 parts of suspended solids per 100,000.

Tannery Waste, Leather Dressings' Waste and Manufacturers' Waste.—These wastes are also highly polluting, and contain much organic matter of animal origin in solution. Our observations in regard to the treatment of wool suds are equally applicable to these wastes, and we make a similar suggestion in regard to a standard—viz., 4 parts suspended solids and 4 parts dissolved oxygen taken up in five days.

Dairy Waste. Here, too, our observations on wool suds are applicable. We suggest as a standard 4 parts suspended solids and 4 parts dissolved oxygen absorption in five days.

Class B.

We now come to that class of trade waste in regard to which we are not in a position to say that efficient means of purification (such as would render them "harmless") are reasonably practicable and available. As we have said, however, some of them—Class B (i.)—are, according to present knowledge, capable of being considerably improved, and it will be useful to indicate to what extent improvement has been found to be practicable.

(i.) *Bleaching.*—In this waste the polluting matter is mainly in solution, but some improvement would be effected by reduction of suspended solids. We suggest that it should not show more than 6 parts suspended solids. Systematic experiments on a large scale would be necessary before suggesting any standard based on the absorption of oxygen.

Waste Bleaching.—The waste liquor from this trade is of the same nature as that from bleaching, but it may contain a good deal of soap as additions. We suggest a standard of 6 parts suspended solids per 100,000. Systematic experiments on a large scale are also required here.

Paper Works (Esparto and Rag Paper, Esparto and Wood Pulp Paper).—The liquid portion of most of these wastes is, as a rule, considerably weaker than that of bleach wastes, but we have found one instance where it was equally strong (owing, probably, to a less abundant water supply). Here, too, systematic experiments on a large scale are necessary. In the meantime we can only suggest a standard similar to that proposed for bleach wastes—viz., 6 parts suspended solids.

Paper Works (Brown Paper and Wall Paper).—For the waste liquors from these works we think that a standard of 6 parts of suspended matter would suffice at the present time.

Cotton Dyeing and Cotton Printing.—Compared with many other wastes, these are not very polluting, but their volume is large. Although most of their oxygen-absorbing power is due to dissolved impurities, considerable improvement is effected by clarification. We suggest as standards 4 parts suspended solids for cotton-dye liquor, and 6 parts for the liquor from print works.

Woollen Dyeing, Piece and Yarn Scouring and Blanket Scouring Liquors (carrying either separately, or in any combination).—Though these wastes are not usually concentrated, their liquid portion is, as a rule, of an oxygen-absorbing and putrescent nature. Clarification produces considerable improvement. As a standard we suggest 4 parts suspended solids per 100,000.

Wool Scouring with Piece and Yarn Scouring and Dye Liquors.—Wool scouring liquor or wool suds when unmixed with other wastes forms the subject of a later paragraph. It is an exceedingly polluting liquid, and when it is combined with those discussed in the preceding paragraph it adds considerably to their strength. If, however, all four liquors, as produced together at the works, are carefully mixed, it is possible to obtain, with the aid of good precipitation, a non-putrescible effluent which does not take up oxygen at an excessive rate. The standard which we suggest is 4 parts suspended solids.

Manufacture of Sulphite Cellulose. So far as we are aware, there are only two works in this country from which either the waste liquid produced by this process or the more dilute washings are discharged into a stream. We are unable to suggest a standard appropriate to the waste liquid, but we think that neither the liquor itself nor the first washings should be discharged into a stream.

Spent Gas Liquor.—Here, too, we are unable to suggest a limit of purification. In no circumstances should the liquor be discharged untreated into a stream. In some cases purification by percolation through "bings" may be sufficient to permit the discharge of an effluent, but we can make no general pronouncement on the point. Where no bings exist, biological treatment on the lines suggested by Dr. Fowler will lessen very materially the polluting power of the liquor. Evaporation appears to be the only other practicable alternative at the present time.

The information which we have set out above is obviously incomplete. It does not extend even to all existing trade processes whereby polluting liquids are produced, though it includes the most important. And it is to be anticipated that new processes will

commercially be carried out operations which create a demand for new means of purification or a demand which could not be economically satisfied by any system of treatment with which we could [illegible]

We do not think it necessary that the central authority should forthwith proceed to prescribe a complete set of standards for all known kinds of trade waste, but we think it eminently desirable that a general standard should be prescribed in all cases where its efficacy and practicability have been in some measure tested by experience. We are confirmed in our view inasmuch as the West Riding of Yorkshire Rivers Board, the Mersey and Irwell, and the Ribble Joint Committees, and the Thames Conservancy Board have progressively employed for their own guidance working rules which are in the nature of standards. It may, however, be necessary to extend the provisions of particular standards by existing and by new processes for which no standard can as yet be fixed.

In the case of some trade wastes additional standards may have to be imposed—*e.g.*, standards of hardness and of "caustic" alkalinity or acidity, or a requirement of neutrality, for the effluents from various branches of the cotton, woollen and paper trades, and from metal works; a standard for arsenic or other poisonous metal for trades in which those substances are used or mined; an oil-film standard for the wastes from oil, gas, grease, or soap works, &c. Some further investigation may be required before such standards—or some of them—can properly be laid down.

These standards should, in our opinion, be looked upon for the most part as special standards, applicable only to certain rivers or reaches of rivers where local circumstances call for them. It is important, however, that the necessity for imposing them in special cases should be borne in mind when the general standard is being considered, for in some cases the special standard may be required more urgently than the general standard. Several manufacturers have, for instance, urged that the "softness" of a river water is of greater moment to them than its organic purity. It will be necessary also to have special regard to the protection of drinking waters against mineral poisons.

Alteration of existing law.

We may now set out in greater detail the proposed amendments of the existing law which have been foreshadowed in the earlier sections of this report. We recommend that the law should be altered so as to provide as follows:—

1. The central authority may by Order prescribe a general standard for effluents produced by any trade process therein defined, the standard to remain in force for a period to be specified in the Order. The Order shall be published in the London Gazette and a copy of it shall be sent to every rivers board, county council, and sanitary authority.*

2. Where a general standard has been thus prescribed, the authority before taking proceedings shall serve a notice on the manufacturer specifying the requirements of the general standard and the period within which the requirements are to be complied with. After the expiration of that period proceedings may be taken against him for non-compliance with the notice (but on no other ground†), and the consent of the central authority shall not be required to such proceedings. The proceedings should not be taken in a County Court for an Order, but in a Court of Summary Jurisdiction for a penalty. The Court may extend the period in which the requirements are to be complied with, and if they consider that it is doubtful whether the notice can reasonably be complied with they shall remit the question to the central authority, who shall confirm, or modify, or cancel the requirements, and who may fix a period during which the requirements as confirmed or modified shall be in force or shall be cancelled, as the case may be. The central authority may from time to time extend such period, but on the expiration of the period the requirements of the general standard shall be deemed to be again in force in regard to the works in question.

3. Where no general standard has been prescribed, the authority, before taking proceedings, shall serve a notice on the manufacturer specifying the degree of purification which they propose to require, certifying that means are available for meeting their requirements, and prescribing the period within which their requirements are to be met. Within one month of the service of the notice, the manufacturer may appeal to the central authority against the notice. If he does not appeal, proceedings may be taken against him after the expiration of the prescribed period as if the requirements of the notice were a general standard in force in regard to his works.

If he appeals the central authority shall confirm, or modify, or cancel the requirements of the sanitary authority. If the central authority confirm or modify the requirements, such requirements as confirmed or modified shall be deemed to be the standard in force in regard to the works of that manufacturer for such period as the central authority shall specify. The central authority may also extend the period within which the requirements must be complied with, and on the expiration of such period, as prescribed or extended, proceedings may be taken without the consent of the central authority for the recovery of a penalty for non-compliance with the standard in force. If the central authority cancel the requirements for a period, no proceedings shall be taken within that period.

4. Where a general standard has been prescribed, but for any reason the authority propose to require of any manufacturer a higher degree of purification than is required by the standard, the authority shall also set out in the notice the requirements of the general standard, and the reasons for requiring the higher degree of purification. In all other respects the procedure shall be as if no general standard were in force.

5. The authority shall be required to prepare an annual report on the administration of the Rivers Pollution Prevention Acts within their jurisdiction, including particulars of all requirements made by them under the Act, whether appealed against or not, and to submit a copy thereof to the central authority.

6. Where a Rivers Board is constituted for any area, the authority for the purpose of enforcing the Rivers Pollution Prevention Acts in that area shall be the Rivers Board. The order constituting the Rivers Board shall provide for the adequate representation on the Rivers Board of any fishing interests concerned.

7. Where no Rivers Board has been constituted, the authority for the purpose of enforcing the Rivers Pollution Prevention Acts shall be the county council, who should act through a Rivers Committee, and the central authority may, by Provisional Order, confer or impose upon the Rivers Committee any powers or duties of a Rivers Board, including the co-optation of representatives of any fishing interests for the said purposes.

New sources of pollution.

Representations have been made to us that the law should be altered with a view to the prevention or regulation of the establishment of new sources of pollution. It has been suggested that every person who proposes to set up works whereby liquid refuse might be discharged into a stream should be required to give notice of his intention to the sanitary authority or Rivers Board, specifying what steps he proposes to take to prevent such liquid refuse from polluting the stream; that the sanitary authority or Rivers Board should have power (subject to appeal to the central authority) to disapprove the proposals; and that any person failing to give notice or commencing to discharge liquid refuse after his proposals have been disapproved should incur a penalty.

We are fully in sympathy with the object of taking measures in advance for the prevention of pollution, but we think that the suggested procedure might involve needless interference with manufacturers. We do not therefore recommend that the law should be altered except to this extent—that the manufacturer proposing to establish new works from which liquid refuse would be discharged into a stream should be required, under penalty, to give to the Rivers Board as long notice as possible, and at least a month's notice, before commencing to discharge. The Rivers Board would then indicate to him the degree of purification which would probably be required of him.

We do not think that a penalty other than for failure to give notice or for actual infringement of a standard should be imposed.

Power of entry.

We repeat the recommendation contained in paragraph 59 of our Eighth Report, which we think

* This expression includes rivers boards, county councils, and joint committees of county councils.

† *I.e.*, not on the ground that he is discharging a "poisonous, noxious, or polluting liquid," but only on the ground that his effluent infringes the particular standard.

should extend to entry on the purification works of manufacturers.

"(59) We think that the officers of the central authority and of the Rivers Boards should have statutory authority to enter upon lands at any time without notice for the purpose of inspecting works and rivers and taking samples of the liquor or effluent and river water wherever they can be obtained. The Rivers Pollution Prevention Act, 1876, contains no provision on this subject, but reference may be made to secs. 16 and 17 of the Alkali Works Regulation Act, 1881, sec. 98 of the Thames Conservancy Act, 1899, and sec. 7 of the Middlesex County Council Act, 1906. In the Mersey and Irwell Joint Committee Act, 1892 (sec. 10) and the West Riding of Yorkshire Rivers Act, 1894, the power to take samples is limited to the point at which the effluent enters the stream. We think the limitation is undesirable."

We recommend further that manufacturers should be required under penalty to provide facilities for taking samples of effluent at the point or points where it leaves their premises.

MINE WATER.

We have already referred to the exemption which is conferred by the Rivers Pollution Prevention Act, 1876, in regard to waters proceeding from any mine "in the same condition as that in which it has been drained or raised from such mine." We are not aware of the circumstances to which this exemption was due. We have received some evidence of the pollution caused by some mine waters of this character, which, in many cases, continues after the mine has ceased to be worked. But our evidence is not sufficient to enable us to make any general recommendation in regard to preventing this form of pollution. Under the system which we have suggested it would be open to a sanitary authority to demand purification of such waters subject to appeal to the central authority, who would be able to consider each case on its merits.

THE NEED FOR FURTHER EXPERIMENTS.

In this and in previous reports we have repeatedly drawn attention to the need for continuous and systematic research in all branches of the wide subject with which we have been called upon to deal. Our labours have extended over a period far exceeding the customary span of a temporary commission, yet we have been unable to explore many fields that are known to require investigation. Were we to continue our labours until we had covered all known fields of inquiry, we should still be faced with fresh problems arising out of social, industrial and scientific developments. We have recommended, in the constitution of a central authority, the setting up of permanent machinery for carrying on the work of investigation, and we would express the hope that if there must be an interval before this machinery can come into operation, there will be devised some method, not requiring legislation, by which research can in the meantime be continued on the lines which we have indicated in our several reports.

Further investigation is needed in regard to the treatment and disposal both of sewage and trade wastes. We are aware that local authorities, manufacturers and others conduct experiments from time to time in regard to particular points of difficulty, but we are impressed with the need of some independent authority which could not only test and coordinate the results of such experiments, but would itself seek the solution of problems which individual enterprise has not yet attacked. We are convinced that in this way great improvement in sanitation concurrently with substantial economies could be secured, and we are therefore confident that the co-operation both of local authorities and manufacturers can be relied on to give and of great value to the work of progressive research.

Cairo Drainage Scheme.—The inauguration of this work, which was first taken seriously in hand in 1907, was performed on March 22nd by the Minister of Public Works. The sewage from each of the sixty-three sections into which the area dealt with is divided is, in the first place, forced by ejectors into a main sewer, and after gravitating for a distance of [illegible] is pumped for a distance of about [illegible] the Nile at Kherda. The [illegible] the complete [illegible] is described [illegible] and on this [illegible] works out at about £E2 per head.

LUBRICATION OF INTERNAL COMBUSTION ENGINES.

Among the patents recently granted is No. 15374 to Mr. C. H. Cooper, M.Inst.C.E., borough engineer of Wimbledon, for "Improvements in and Apparatus for Lubricating Internal Combustion Engines."

Most causes of trouble in internal combustion engines have been overcome. Some of the devices, however, introduced for lubricating the pistons of these engines insure such a distribution of lubricant to the various pistons as to prevent seizing, with its accompanying dangers, or excess of carbon deposit due to over-oiling.

Mr. Cooper appears to have been the victim of the troubles that beset the motor cycle, whether such troubles were due to an absence of direction signs or to the internal complaints of the animal itself. The conclusions he has arrived at as regards lubrication are:—

(1) That lubricant should be admitted to the piston at such period in the engine's cycle as will insure a minimum amount being present when the explosion takes place.

(2) That the supply of lubricant to each piston should be independently controlled.

His device for affecting these desiderata contains lubricant under pressure while the amount of such lubricant admitted to the piston is controlled by the valve marked **E** on the accompanying plan; this valve also controls the moment when the lubricant is admitted on to the piston—that is, at the end of the explosion stroke—so that the lubricant is evenly distributed before the next explosion takes place. Valve E is actuated by a cam L on the magnet's shaft. This cam revolves in a slide J, the

Fig. 2.

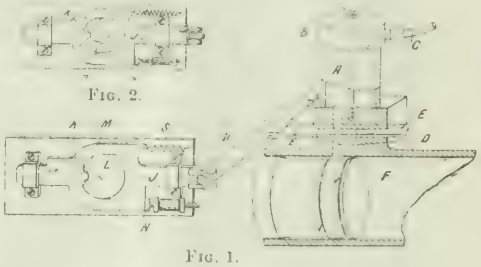

Fig. 1.

position of which is controlled by an adjustable stop N, the adjustment of which is regulated by a sleeve screw. The slide is pressed against the adjustable stop by a spring S. As placed in Fig. 2, the cam can revolve without engaging the slide, so that valve E remains closed. If the stop N is released, as shown in Fig. 1, the cam engages the slide so as to cause the slide to reciprocate; these reciprocations are transmitted by lever H so as to actuate valve E, the amount of which this valve opens, and consequently the amount of lubricant admitted to the piston, is controlled by stop N.

The plan shows the device applied to one cylinder only. In the case of two or more cylinders each will have an independent slide and control, all of which may be worked off the same cam, provided that each slide is placed at such a distance as to admit of the supply of lubricant at the desired period.

The device [illegible] is in addition to the [illegible] includes the following:

(1) Lubrication takes place [illegible] when the engine is at work, so that there is no need to handle taps or pumps—a feature every motorist will appreciate.

(2) The device will admit of grease being used.

(3) As the lubricant is admitted on to the piston, better distribution is effected than in the splash system, where the lubricant has to work up and round the piston.

We see from the provisional applications that Mr. Cooper has designed various methods of applying the principle [illegible] more complex than that now described. We wish Mr. Cooper every success with what appears to be a [illegible] portant improvement in the engine which is now universally used.

Extraordinary Traffic.

DISCUSSION OF MR. D. M. JENKINS' PAPER.

The paper on Extraordinary Traffic [illegible] by Mr. D. M. Jenkins, Assoc.M.Inst.C.E., Engineer and Surveyor to the Neath Rural District Council, at the recent South Wales District Meeting of the Institution of Municipal and County Engineers, at Cardiff, was printed in our issue of March 26, page 463. The paper was considered [illegible] Engineers and Surveyors.

Mr. Thomas (Mr. W. Harper Carey, Engineer and Surveyor to the Cardiff Rural District Council) said he would be glad to hear the opinions of members on the question of extraordinary traffic claims.

Mr. C. A. Phillips (Aberdare) said [illegible] Mr. Jenkins on the very full manner in which he had dealt with the matter. The paper would be very helpful to members who had to deal with claims for extraordinary traffic. Anyone who had to prepare such a claim would find the paper very helpful. Personally he had had to deal with a claim for extraordinary traffic which was started by the previous [illegible] from. Experience had taught him a very valuable lesson in preparing his claim, and also in the [illegible] to lay before the court. In the claim he had referred to [illegible] really all they [illegible] was cut out because sufficient details of the expenditure had not been kept. The question seemed to [illegible] As the author pointed out, on main and arterial roads the [illegible] up their roads to such a standard as would carry [illegible] Rhymney and [illegible] passed in Glamorgan, tracks of a very [illegible] to the roads and [illegible] that the roads ordinarily were called upon to carry [illegible] against any particular traffic unless in connection with any works, [illegible] Still there were [illegible] character which often got damaged by traffic, which it was perhaps [illegible] such as the cutting down and hauling away of timber [illegible] about 6 or 7 miles away from Cardiff. [illegible] road was much damaged by [illegible] to the [illegible] large reservoir at Pontsticill. Mr. Harper might be able to tell them something about [illegible] He had been connected with the preparation of claims in cases of extraordinary traffic, and his experience had led him to the conclusion that it was much better to do everything [illegible] agree with their adversary. Directly the extraordinary traffic began they should try to arrange the basis upon which payment for the repairing of the damage done could be made. At the same time it was well to keep very careful records of the cost and also of the traffic, so as to be able to lay them before the court. In each case he had had to deal with, he thought without exception, they had been able to arrange with the parties who were damaging the road, and, taking them generally, he thought the arrangements come to had been fair, and they had avoided a large expenditure in law costs. He thought he was right in saying that courts, as a rule, were not sympathetic towards claims for extraordinary traffic.

Mr. H. C. Rimell (Cardiff) explained that Mr. Priestley, waterworks engineer of Cardiff, who was unable to attend the meeting, had requested him to read a statement which he had prepared on the paper. Mr. Priestley stated that the author mentioned especially a case which had come within his own knowledge in his district, where damages were obtained for the extraordinary traffic caused in the conveyance of materials for the construction of a service reservoir. This reservoir was, he gathered, outside the borough of Neath; therefore there would be no additional rates payable in respect thereof to the town, which would not in any way benefit therefrom. In these circumstances the corporation no doubt felt justified in obtaining compensation for the considerable expense to which they had been put owing to the undoubtedly extraordinary traffic upon their roads. He would give them an instance, or rather instances, of similar extraordinary traffic caused by [illegible] him in the neighbourhood of Cardiff, the two reservoirs being in the districts of separate authorities. He was informed that application for payment would be made in each instance with regard to the extra traffic caused during construction on the roads leading to these reservoirs, but in neither case was an actual claim made, nor proceedings taken. Circumstances were different from those in the case mentioned by Mr. Jenkins, as in both instances the [illegible] district authorities. The rates were, therefore, increased in each district, and in addition thereto the reservoirs were being built for the benefit of the ratepayers within the respective districts. These circumstances, he maintained, should be taken into [illegible] to make a claim for extraordinary traffic, and presumably in each of the cases mentioned this fact was not forgotten, or he would probably have received a demand. He would ask Mr. Jenkins to give him his opinion upon the cases which he had mentioned, and the circumstances [illegible] making a claim. It would be interesting to know what proportion of the claim made was actually received, but there might be good reasons why Mr. Jenkins should not feel justified in giving this information.

Mr. L. Holmes (Cardiff) said he was afraid the case referred to by Mr. Phillips had not gone on very far yet. They were still busy cutting up the road. They had been very careful to do as Mr. Jenkins advised, and keep records of damage.

Mr. W. L. Harper (Brecon County) observed that the question of extraordinary traffic was very difficult. He thought it was easier now than in days past because they had had practically to take everything which came upon the roads, with the exception of new works and things of a temporary character. They suffered in his county a good deal from timber hauling. They brought a case some years ago which they lost, and his county did not seem inclined to go on with claims. They said "the timber had been rated for years, and if any damage is done when it is hauled away it is best to put up with it." He had one case when he happened to be a contractor's engineer where they paid about 12 per cent of what was actually claimed, which the county surveyor accepted. If the case had gone on he thought the contractor would have won it. He was under the impression that the Locomotive and Motor Car Acts were not looked into as they should be. He believed that the dead weight per axle was often exceeded. If that were looked into they would get some relief. Mr. Priestley was now constructing a reservoir in his own county, and, of course, they would in the future get rates from it. At present there were no extraordinary traffic, but if they did get extraordinary traffic from this work he should not hesitate to bring a claim against Mr. Priestley. If they had to make such a claim he thought they would certainly win, because Mr. Jenkins won in a similar case at Neath.

Mr. D. M. Davies (Neath Rural) said he was particularly interested because he was one of the parties referred to in the Neath case. They constructed this reservoir outside the borough area, and their contractor was responsible for the damage done by the extraordinary traffic. He thought the damage was mainly caused by the excessive weights carried by the sub-contractor, and was due to no fault of the contractor. The contractor, he thought, made one mistake when he did not protect himself when he let the sub-contract. The reservoir was some 400 ft. or 500 ft. above the level of the town. The greater part of the road over which the loads were carried was within [illegible] district, and a very short length within the borough area. Their section of the road did not suffer to the same extent as the road in the borough, owing to the foundation of the road. They had some extraordinary instances of claims for extraordinary traffic—one for timber, one for stone, and one for the storage reservoir for the borough of Neath. They had no benefit of supply, but they had the benefit of the rateable value. They

considered they had a claim for the damage done. Mr. Jenkins had protected his corporation by a clause in the contract as to damage. They claimed £89 from the contractor, Mr. Allen, and he came forward and promptly paid it. He took it from that that he felt he had had value for his money. With regard to claims for timber haulage, their clerk had always advised them to settle if they possibly could with their adversary. There was no doubt the day was arriving when the roads must be made sufficiently strong to take all the traffic of the district. They had traffic now which they would not have dreamt of five years ago. They had engines with two trailers, each carrying a load of 6 or 7 tons, and that was what they would never have thought of in the past.

Mr. E. Whitwell (Abersychan) said the question of extraordinary traffic was one of the most neglected in the departments of a surveyor. Mr. Jenkins stated that with merely occasionally heavy traffic the road had time to recover itself in between. He could not imagine that a road which was damaged in a material sense could ever recover itself. No one who noticed a highway in which there were deep ruts ever saw those ruts disappear except by repair of the roadway. Mr. Jenkins might possibly enlighten them as to his meaning on that point. With regard to annual cost per mile of repairing the roads, Mr. Jenkins suggested (and probably gave them the practice in other similar cases) that the average to be taken should be a period of five years. That might be rather difficult if the road had not been recoated during the five years. There were cases in which roads lasted eight or ten years without recoating. Mr. Jenkins suggested that notice should be given to the party when the damage commenced. He agreed that directly any signs of damage became apparent an intimation should be sent to the person responsible. Mr. Jenkins also referred to the importance of keeping a road ledger. Was it possible to keep a road ledger which was sufficiently accurate as to costs, and, if so, in what form did he keep it? He had adopted a form for some years and found it very difficult. There were so many things—sweeping, cleansing, watering, and so on. Even in his district he had 70 or 80 miles of road, and it would take two clerks to keep an accurate account.

Mr. H. A. Clarke (Briton Ferry) said the attention of most surveyors was engaged now on this subject, and the information given in the paper was most valuable. Some years ago, during the construction of a railway through his district, the contractor carted over one of their roads considerable quantities of the material required for bridge construction, and did much damage. Traction engines were not then in vogue. When the question of the payment of the increased cost of repair and maintenance was brought to the contractor's notice, he did all he could to get out of it. Eventually a bargain was struck that the contractor should, at the completion of the haulage work, resurface the portions of the road required by the surveyor. The council at that time thought such procedure was better than taking the usual proceedings for recovery. Then a few years ago the council took over the maintenance of a canal towing path—length, approximately, 800 yds.—which averaged 12 ft. in width. The track had been abandoned as a towing path, and reformed with a fair foundation and metalling. At the time the ordinary traffic was light, consisting of horse-drawn vehicles, conveying coal, bricks, &c.; to a small industry, and small tradesmen's carts. Subsequently a new industry was started, with the result that upon this narrow road the traffic increased considerably in quantity and weight—loads ranging up to 5 tons in wagons having ordinary wheels. The traffic being in the same rut continuously, the sides, being weak, were squeezed out, making it necessary to construct concrete retaining walls to support the [illegible] deal, and the council endeavoured to prevail upon the proprietors of the new industry to contribute toward the increased cost. This they declined to do. They admitted that there was a considerable volume of traffic, but contended that it was not heavier or more destructive to the roads than the average traffic of the district, and did not agree that the case came within sec. 23 of the Highways and Locomotive (Amendment) Act, 1878. Probably his council showed some weakness there, for they decided not to take [illegible] might prejudice the development of the new industry. It might be a reasonable view to take that a charge should only be made for extraordinary traffic where the work was of a temporary nature; but where a new industry had developed the increased cost should be borne by the road authority, notwithstanding the fact that the road was unsuitable for such traffic.

Mr. Edwards observed that five years was the time given in the paper for averaging the cost per mile of road repairs. In his district, where there was extraordinary traffic, it was largely due to the development of the district. The cost of his roads had been about £40 per mile per year, but while the model village was being erected by the colliery company it would probably run up to £160 per mile. The question was whether the council would not be justified in looking upon the higher expense as due to the development of the district. The colliery company paid about one-fourth of the rates; the model village was being erected by the colliery company, and the whole of the haulage was done by traction engines carrying about 10 tons.

The Chairman, in closing the discussion, remarked that in Cardiff they had never made a claim of this kind, though there was a case going on now where they would be perfectly justified in making a claim. He intended putting the matter to his committee, and leaving it to them as to whether they should make a claim or no; but for forty years they had never made a claim for extraordinary traffic. Their extraordinary traffic had been in the carting of building material for the natural development of the city, and it had been over roads where there had been a great deal of other traffic, and it would be difficult to make claims for damage for any special haulage. There was a point in connection with roads which had not come under Mr. Jenkins' paper; it did not affect that aspect at all. It was a rather important one—that was the strength of the bridges upon the roads of the country. This question was raised some few years ago; he did not recollect exactly how it arose, but he thought it was on a paper discussed at one of their meetings. It raised the question what, in case of this country going to war, would happen with so many weak bridges which were only just capable of taking the ordinary cartload of stone or building material? They could imagine if they had had in this country what had happened in Belgium and a part of France; if the enemy came into this country and the War Department had to carry the munitions of war over the hundreds of bridges, how would they manage to do it without those bridges collapsing? At that time he thought it was suggested that the attention of the War Office should be called to the point. He was not sure whether it was or not, but at any rate nothing was done. It was of very great importance that they should consider the carrying capacity not only of the roads, but of the bridges, because, after all, the strength of the road was no good unless the bridges would carry the traffic. Since he had been in Cardiff they had reconstructed over fifty bridges—practically all the bridges which would not carry a motor or traction engine with its trailers. There was only one bridge which had not been so reconstructed. He put it to them to consider whether not only the roads, but the bridges should be made sufficiently strong to carry all the traffic.

The vote of thanks was carried.

Mr. Jenkins, in replying, said the object of the paper was not, of course, to encourage litigation. He quite agreed with what Mr. Phillips and Mr. Whitwell had said—that in all cases of extraordinary traffic it was far better to compromise than to go to litigation. It was a very thorny subject, and all sorts of points cropped up, and although the Courts had now laid down a clear issue, it was far better to settle when possible, even if the amount were less than they thought they were entitled to. Mr. Edwards raised a point as to extraordinary traffic arising from extraordinary development of the district. He would not advise his council to bring an action in a case of that kind. He thought it would be very doubtful if that would be extraordinary traffic. Mr. Phillips had referred to the difficulty, in some cases, of getting sufficient details of expenditure. He did not think the Courts were very exacting in that respect; they had to show that their cost in repairing the damage caused by the extraordinary traffic had been about so much. Mr. Priestley had asked whether a highway authority was justified in making a claim for extraordinary traffic in connection with works in their [illegible] tage from rating. That was a matter for the council to decide. Where there was going to be a big revenue from work it was a question whether a claim for

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And Municipal and County Engineer.

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extraordinary traffic was worth pleading, but that did not affect the question of his right to plead. All Prosser also asked for the production of the [illegible] Limited. He would not say the exact amount, but it was a very substantial sum. It was to be attacked who had to pay, and there were circumstances which made it advisable to accept a reduced sum. The question of timber haulage had been referred to by one or two speakers. There was a popular impression that if any traffic was connected with established industries they could lay a claim to extraordinary traffic. That was quite a mistake. It all came back to this: What was the character of the road, and what was the ordinary traffic on it? In the case of timber haulage a man bought a certain amount of standing timber, and had to haul it away. That occurred every few years. He did bring on to that road traffic for which it had not been constructed and beyond the limits of ordinary traffic, and it had been held that a claim for extraordinary traffic lay. He might say that the damage spoken of in the paper was, to a great extent, due to the excessive weights brought upon the road by the sub-contractor; but the difficulty was that the sub-contractor appeared to have no responsibility at all. He knew that 7 tons were carried in these wagons until the sub-contractor said that if the traffic was continued it would make the road impassable for himself. Their road had a bottom of very soft clay, whereas there was a very much stronger bottom in the rural district. Moreover, their road had a very heavy gradient; that outside the borough was much less. They were bound to agree to make all roads to stand motor traction traffic; but it was going to be a long time before all rural roads had to stand heavy motor traffic, and it would be an extravagance to put in a strong foundation for it. It would be as unreasonable as to make their sewers and storm-water drains sufficiently large to carry the heaviest possible storm rainfall. It must be obvious that there were a large number of roads which could not be made so expensively as the main and arterial roads. With respect to Mr. Whitwell's point as to the recovery of roads they all knew that roads had a certain resiliency, and if there was no repetition of the extraordinary traffic the road practically recovered itself. As to the annual cost of a road per mile, the period of five years was taken for the practice of the Courts, and had been held to be a reasonable period to take. As to a road ledger, he admitted that they could not keep their road costs with absolute accuracy, but it was possible to keep the ledger within reasonable limits of accuracy.

THE ROYAL COMMISSION ON SEWAGE DISPOSAL.

AN APPRECIATION.

By John D. Watson, M.Inst.C.E.,
Engineer to the Birmingham, Tame, and Rea District Drainage Board

After more than sixteen years' investigation and deliberation the Royal Commission on Sewage Disposal have issued their Final Report. Very few Royal Commissions have laboured so long or done better public work, and it is to be regretted that only three of the original nine members (Lord Iddesleigh, Sir William Ramsay and Colonel Harding) remain to receive the gratitude of the public for their valuable services. That the commission have maintained an even course, notwithstanding the changes in its personnel, is very largely due to their able secretary, Mr. F. J. Willis, whose recent appointment to a seat on the commission was a graceful acknowledgment of his ability and indefatigable services to the community. The commission had its genesis in the clamour of sanitary experts for more enlightened and less stereotyped treatment of schemes of sewage disposal, and in their First Report, issued in 1901, the commission dealt with the chief question in dispute—viz., whether it was practicable to produce, by artificial processes alone, effluents which will not putrefy, which could be classed as good according to ordinary chemical standards, and which might be discharged into a stream without creating a nuisance. This they answered in the affirmative, and went on to express the opinion that the Local Government Board would be justified in modifying, under proper safeguards, the application of sewage to land.

Around this salient feature of the Interim Report an immense amount of valuable work has been done by the commission, work for which I have nothing but admiration; but critics have not been wanting who have said that the recommendations following upon it have been lacking in definiteness, that they have been inconsistent, and more likely to be a source of weakness than strength.

This criticism evinces lack of appreciation of the [illegible] and traces a narrow outlook on the part of the critic. Those who say that the Royal Commission after all those years of study should have been able to state clearly and definitely what is the best method of treating sewage do not realise that there are hardly two sewages alike, and that even in the same town the leading characteristics of the sewage sometimes change as the town develops. The very reasons which account for such a prolonged study of the subject as the commission have made during the past sixteen years may be adduced to prove the unwisdom of dogmatic assertion where the treatment of so changeable a substance as sewage is concerned. The commission have done what was most needed—they have obtained and made serviceable vast stores of information, they have recorded individual views, and they have expressed their own without equivocation in such a manner that the expert is encouraged to study specific cases in the light of the best modern scientific opinion and practice. To have attempted to set up a best method of treatment, as one would a best process of manufacture, would only have prolonged the thraldom so irksome to an engineer who wishes to stamp his work with some individuality—a thraldom which obtained to a great extent in the days when nothing but land treatment would satisfy the Local Government Board.

The history of the sewage question shows too clearly the

INFLUENCE OF ROYAL COMMISSION REPORTS

in their tendency to stereotype the methods and practice of great Government departments. We cannot forget that commission after commission have stated that land treatment was the only proper method of sewage disposal; nor have we forgotten the claims that were made on behalf of the Exeter septic tank process, and its extravagant claim to have solved the sludge problem, besides many other less-known claims that have been accepted and rejected in turn. But the Iddesleigh Commission have rid us of this bugbear. They have adopted the view that each purification scheme should be considered on its own merits, and that the nature of the stream or watercourse into which an effluent is to be discharged must be taken into account as well as the quality of the effluent. This, in my judgment, is a sound attitude to adopt towards a subject which unites indissolubly applied science with progressive scientific knowledge.

Their Third Report indicated that the commission

were satisfied that the law required to be altered in several particulars, and that a central authority be established possessed of adequate technical knowledge and statutory power to determine differences without being obliged to have recourse to the Law Courts.

The proposed drastic change has been received with a good deal of sympathy, as the impossibility of adopting a law which would be applicable to all cases of sewage purification is almost universally recognised. As the law stands local authorities are bound to see that sewage is treated in such a manner that it is freed from all excrementitious, foul or noxious matter such as would affect or deteriorate the purity or quality of the water into which it is discharged—a duty which may be tantamount to requiring the local authority to do the impossible. If sewage works for which the local authority is responsible are located on a pure stream, the cost of providing works to comply with the law would be ruinously expensive, and if the effluent were not greater in volume than 1/2000th part of the river into which it is discharged—as in the celebrated Llanrwst case—the absurdity of enforcing the law would be apparent to all but the most biassed. When, however, one comes to consider the need for setting up Rivers Boards, the wisdom of the recommendations of the commission is not so apparent, as there are several notable instances of existing county rivers authorities having done good work at comparatively little expense, and I am glad to see that this view appears to be recognised in the Ninth Report. Whether a river authority does good work or not is probably more a matter of individual initiative than administrative machinery.

The Eighth Report contains a recommendation which has caused a good deal of discussion, and which in the opinion of some is the crux of the sewage disposal question—viz., the setting up of a standard for effluents. This recommendation was regarded by the Association of Municipal Corporations as of sufficient importance to warrant them in inviting experts to consider the question in all its bearings. This Expert Committee, after several meetings for discussion (at one of which the officers of the Royal Commission were good enough to enter into an informal conference with the members), reported to the Association of Municipal Corporations that it is not desirable that

STANDARDS OF PURITY

should be prescribed by Parliament.

A standard fixed by Act of Parliament would do far more harm than good. Nature varies her requirements in the different seasons of the year, and the sound principle admitted by the commission that the quality of an effluent should have a definite relation to the quality of stream into which it is discharged should be emphasised. A statutory standard would strangle that principle.

Our legislators should aim at the conservation of pure, and the improvement of polluted streams, but they should never forget that a manufacturer has the right to a reasonable use of a stream passing through his property no less than the sportsman and angler. Adherence to a uniform standard for sewage effluents would frequently inflict unnecessary hardship upon local authorities and individuals, as it would be unreasonable to expect even the most up-to-date sewage plant to give as good effluents in winter as in summer, or as good effluents during the day as during the night, when the normal strength of the sewage is greatly reduced. No doubt the capacity of the plant could be materially increased so as to obtain more equal effluents than the best works produce at the present time, but the cost would be great and the gain in most cases would be inappreciable. The responsibility attached to a local authority is sufficiently great without imposing irksome duties the benefits from which would be altogether disproportionate to the labour and expense involved. The Iddesleigh Commission are entitled to respect for having adhered to their original purpose to have regard to economy in their recommendations.

If the central authority when appointed is able to furnish local authorities and their engineers with specific indications of the quality of effluents which they are prepared to accept in specific cases, a great public service will be rendered; but to do this it is essential that that authority must have a free hand to deal with individual cases without being hampered with one, or even several, typical standards specified by Act of Parliament.

However reluctant I am to advocate the multiplication of Government Departments, I am convinced that the Royal Commission are justified in suggesting that an ordinary law court is not a suitable tribunal to deal with river pollution cases, and that a central authority is much more likely to deal out even-handed justice than the court whose function is merely to administrate the law. The greatest care should, of course, be taken to see that it is not possible for one authority to order works which would not be accepted by another authority. The Local Government Board now have the power to refuse borrowing powers for the construction of new works, and when such powers are granted there must be conformity to certain requirements of the board, and care should be taken to see that these requirements do not clash with the requirements of the proposed central authority. If so it will eventually it may be necessary that the central authority should in some way be affiliated to the Local Government Board, but it will be necessary to bear in mind that Parliament is under no obligation to accept the lead of a Government Department when asked to approve of a Bill to authorise the construction of public works. It would be anomalous for either Parliament or the Local Government Board to approve of sewage purification works capable of producing an effluent which would comply with a much higher standard than the central authority deem necessary.

THE NINTH REPORT

is not at all likely to give universal satisfaction. It is sure to meet with opposition from certain quarters and certain manufacturing districts; but, taking it as a whole, it seems to meet the difficulties fairly well, although I still adhere to the view, however reluctantly, that the only way out of so many obvious difficulties is for the central authority to take full responsibility for deciding what is essential in individual cases.

The difficulties surrounding the question of standards for effluents from purification works dealing with ordinary town sewage are great, and they are not diminished when trades waste has to be dealt with. It appears to me that manufacturers will have to trust to the integrity of the central authority, just as the local authorities have learned to trust the integrity of the Local Government Board.

The commission has been so long in existence that its end will not be unwelcome to some, but it will also be regretted in many quarters where its help was as freely given as it was much needed. Distillers on the Scottish rivers, owners of oyster beds, and residents on Belfast Lough, and municipalities all over the kingdom will look in vain for the repetition of that unbiassed scientific advice which the commission have been able to give through their exceptionally able staff, unless, indeed, the central authority when created is actuated by a similar spirit.

No one who understands anything of the subject of sewage purification can honestly say that the problem has been solved. Much has been done during the past generation to bring us nearer a satisfactory solution, but much still requires to be done, and a great advance will be made if when the central authority is established it is provided with sufficient funds to set up as part of its working machinery a research laboratory on the lines of the research department which the Massachusetts State Board of Health has had for so long.

Royal Institute of British Architects.—At a meeting to be held on Monday, April 19th, Mr. Segar Owen (Fellow) will read a paper on "The Design and Construction of Buildings for Industrial Purposes."

Quarry Bank Surveyor and the Mud Cart.—Mr. Furber, Quarry Bank's surveyor, says the *Brierley Hill Herald*, does not look like having a mud cart and brush just yet. He has worked hard to get the sanction of the council for its purchase, but now that he has succeeded in getting the members to his way of thinking he finds that there is no money to spare for the luxury. Mr. Furber has to suffer adverse comments upon the condition of the roads of the township, and few people seem to realise how helpless he is in the matter. Bricks cannot be made without straw, and roads also cannot be kept in good repair without money being spent upon them. Quarry Bank is probably the only district in the country where a mud cart and brush would be looked upon as a luxury. Every other town consider them necessary possessions.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. M. INST. C.E.

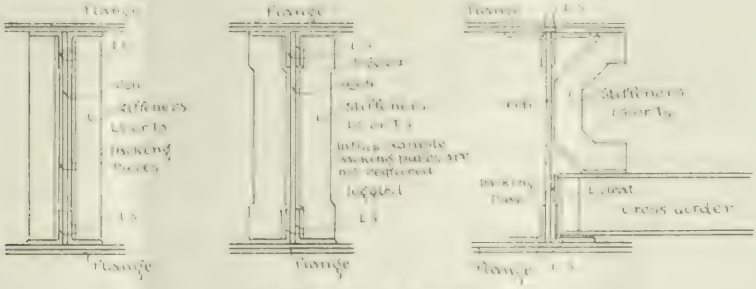
All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24, Bridelane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

466. Road Making.—Describe a test that will enable an engineer to ascertain the quantity of the bitumen and filler to be used in a bituminous macadam road. (L. . . .)

469. Sewage Sprinklers.—Give a good practical method of marking off the holes in the [illegible] to the question which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.



SOME EXAMPLES OF STIFFENERS.

[illegible] arms of revolving sprinklers. The diameter of holes to be constant. (C. A. B., *Catford.*)

471. Building Construction.—[illegible] Explain its function and give sketches to illustrate. (M. T. R., *Rhyl.*)

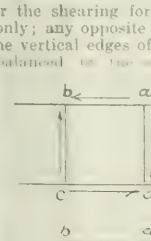
472. Statics.—Discuss the relative advantages of the graphical and analytical methods in the determination of the stresses in a framed structure. (M. T. R., *Rhyl.*)

REPLIES TO QUESTIONS.

468. Girder Design.—Explain a method for determining the position of the web stiffeners in a plate girder. (J. F., *Padiham.*)

The following alternative reply to this question has been received since our last issue.

In the web of a girder the shearing force does not act in one direction only; any opposite tangential stress acting along the vertical edges of a rectangular plate must be balanced by the moment of a pair of tangential stresses acting along the horizontal edges, and these forces, in all cases, will be proportional to the respective sides of the rectangle. The horizontal shearing force acting along *ab* will be to the vertical shearing force acting along *ad*, as the side *ab* is to the side *ad*. This necessary equilibrium applies also to every portion of the plate. If the panel *abcd* be divided into any number of square or rectangular compartments, as sketch, each individual rectangle will be subjected on every side to a shearing force proportional to the length of that side. The straining effect produced upon the rectangular plate *abcd* by these opposite shearing forces is a tendency to distort its rectangles to parallelograms, as *abcd*, the sides of the rectangle being unaltered in length, but the angles altered, as in the case of a bolted joint subjected to shearing strain. The diagonal *ac* will be extended and the diagonal *bd* will be extended; the shearing stress will produce no extension or compression of the horizontal or the vertical fibres, but all fibres sloping in the direction of *ac* will be shortened, and all fibres sloping in the contrary direction will be stretched. The resistance



which a solid body offers to such a distorting strain is really due to the direct resistance of its particles to tensile and compressive strains in diagonal directions, and the special function of the web in transforming vertical forces into horizontal stresses can as well be performed by a series of diagonal bars uniting the two flanges and crossing each other, and in such a case each bar would have to exert merely a direct tensile or a direct compressive stress. The web is assumed to have the shear uniformly distributed over it; therefore the minimum area of the web should be such as to keep the shear stress within safe limits.

D = depth of web in inches
t = thickness of web in inches
f_s = the safe shear stress
S = the shearing force at the given point

$$t \times D \times f_s = S$$

$$t = \frac{S}{f_s D}$$

The thickness of the web may require to be increased at the ends beyond that necessary for shear stress to provide sufficient bearing area to give a reasonable pitch to the rivets. As previously shown, the shear stress causes tensile and compressive stresses at right angles to each other, and at 45 deg. to the direction of the shear stress; therefore the web buckles, due to the compressive component of the shear stress. To make allowance for this it was first proposed to treat the web as a strut equal in length to the diagonal of the panel, with diameter equal to the thickness of the web, and work on Gordon's formula. Mr. Theo. Cooper, of New York, suggested a similar formula with different constants, the distance between the stiffeners being taken instead of the length of the diagonal. Cooper's formula for the shear stress to adopt in plate girder webs is:—

$$\frac{\text{shear in tons}}{\text{area of web in sq. in.}} = \frac{5}{1 + \frac{d^2}{1500 t^2}} = f_s$$

where d = distance apart of stiffeners in inches
where t = thickness of web in inches

From this we get the theoretical spacing of stiffeners, if the thickness t is fixed

$$d = 38.5 \sqrt{\left(\frac{f_s}{5} - 1\right)}$$

$$\therefore \frac{d^2}{1500\,t^2} = \frac{5}{f_s} - 1$$

$$\therefore d^2 = 1500\,t^2\left(\frac{5}{f_s} - 1\right)$$

$$\therefore d = 38{\cdot}7\,t\sqrt{\left(\frac{5}{f_s} - 1\right)}$$

(E. W. P., *Southampton.*)

470. Structures.—What are "deficient" and "redundant" frames respectively? Give some outline diagrams as illustrations. (T. R.)

A theoretical framed structure is built up of a number of straight bars "pin-jointed" at their extremities, and when the centre lines of the bars are all in the same plane it is termed a plane frame. A framed structure is designed, as far as possible, so that the members have only pure tension or compression stresses, bending stresses being obviated. Joints may be either "riveted" or "pin-joints." In calculating the stresses in the members of a framed structure it is always assumed that the joints are "pinned."

(1) A framed structure may be deficient or under-firm.
(2) ,, ,, ,, perfect or firm.
(3) ,, ,, ,, redundant or over-firm.

(1) A deficient or under-firm frame has an insufficient number of bars to keep it in equilibrium for all systems of loading.

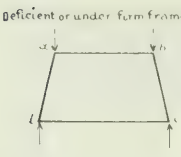


Fig. 1.

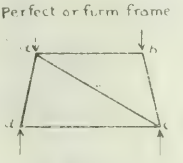


Fig. 2.

Fig. 1.—For certain values of the forces acting on it, this frame would be in equilibrium, but it would collapse if the forces were changed.

(2) A perfect or firm frame has a sufficient number of bars, and no more to keep it in equilibrium for all systems of loading.

(3) A redundant or over-firm frame has a more than sufficient number of bars to keep it in equilibrium for all systems of loading.

A deficient or under-firm frame with actually "pin-joints" is in unstable equilibrium, and if the joints be riveted its stability will depend on the stiffness of the joints, the members being then subjected to bending stresses which it is the object of the framework to avoid.

In a redundant or over-firm frame any stress in a member caused by bad fitting or change of temperature will cause stresses in all the other mem-

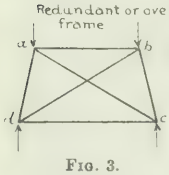


Fig. 3.

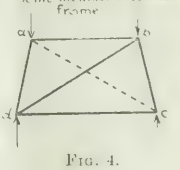


Fig. 4.

bers, which it is impossible to calculate by simple mathematical or graphical process. These frames are consequently termed "statically indeterminate."

(4) Semi-member or Counterbraced Frames.—Certain frames having the appearance of "redundant" frames act as "perfect" frames, and may be treated as such.

Fig. 4.—The two diagonal bars *ac bd* each can act in "tension" only, so that if the loading tends to put one of the diagonal bars *ac* in "compression," it would go out of action, and the frame would act as if *bd* were the only diagonal.

The diagonals *ac bd* are semi-members, or counterbraces, and are commonly used, especially in the centre panels of railway bridge trusses in which the crossing of the load causes a reversal of the stress in the diagonals.

Fig. 2.—In a perfect or firm frame the bar *dc* has two joints; two more bars, *ad ac*, are required to produce the next joint *a*, and so on to complete the frame.

∴ If N = number of joints in the frame, two of these will be required for the first bar, and the remaining joints, N−2, will require 2(N−2) bars.

∴ The total number of bars = 2(N−2)+1 = 2N−3.

∴ In a perfect or firm frame the number of bars is equal to twice the number of joints minus 3.

In cases where the number of bars is more than this the frame is "redundant," and where less it is "deficient." (E. W. P., *Southampton.*)

A frame is a structure composed of bars, rods, links or chords united at their extremities by joints which offer little or no resistance to rotation of the frame. The function of a structure is to transmit force. When determining the stresses in the different members of a structure of this type by the application of the principles of statics, we regard all joints as hinged, although they may be riveted in the actual structure under consideration. Any stiffness or rigidity that a frame may possess in virtue of its joints being riveted is neglected for purposes of design. Frames may conveniently be divided into three classes—viz.:—

(1) Perfect frames, which have just sufficient struts and ties, and no more, to preserve the shape of the frame under load.

(2) Deficient frames, which have not enough ties and struts to prevent the distortion or rotation of the frame under load.

(3) Redundant frames, which have a larger number of members than required to resist change of shape under load.

The stresses in frames of class No. 1 can be determined by the application of the principles of statics, while those in frames of class No. 3 cannot be determined by these means alone, but require also the use of the "principle of least work" for their solution. The definition of this principle is as follows: "The true stresses in a redundant elastic system in stable equilibrium are such that the internal work stored therein is a minimum.

To apply the above in the solution of a problem of this nature involves the use of Hooke's Law of Elasticity, and presumes a knowledge of the sectional areas of all members of the frame. The problem of the design of a redundant system appears, therefore, to be an indeterminate one. This is the principal reason why redundant systems are not regarded so favourably as formerly, and this is specially true with respect to the employment of such systems in structures of large dimensions. However, redundant systems perform their function economically when loads carried are comparatively light, and when stiffness is a consideration—for instance, lattice girders with multiple web systems, as used for foot bridges, and light girders of the double Warren type, as used to carry small rolling crane loads. (M. T. R., *Blyth.*)

Glasgow Town Planning Scheme.—The corporation of Glasgow have applied to the Local Government Board for Scotland for authority to prepare a town planning scheme with reference to lands at Kennyhill and Riddrie. Besides the corporation there is only one other proprietor of ground within the area included in the scheme, and, so far as known, he is not opposed to it.

"Tarvia." As was recently pointed out by the War Office, the manufacture of high explosives is dependent on the supply of certain by-products obtained from the distillation of coal tar, and the authorities have made a special request that under the present circumstances nothing but dehydrated or refined tar shall be used for road improvement. A circular which Messrs. Bristowe & Co., Limited, 11 Tothill-street, Westminster, are issuing to their customers, states that "Tarvia" complies in every respect with this requirement, all the elements from which high explosives are prepared having always been carefully removed in the manufacture of their material. "This process," it is added, "ensures the reliability of 'Tarvia,' owing to these products which are not only useless, but absolutely detrimental to road making and treatment, being entirely eliminated. By using Tarvia you not only assist assisting the Government, but ensuring good results."

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Armagh T.C. (March 31st. Mr. P. C. Cowan).—£1,300 for the purpose of [illegible] the supply of water to the district within the town. Mr. [illegible] Kennedy, stated that during the past [illegible] had been twice subjected to great shortage of water owing to insufficient storage capacity in the reservoir at Lavey's Lake. It was proposed to raise the weir by 2 ft. to remedy this defect, and it is necessary to acquire additional land, hence the application for this loan.

Burnley T.C. (March 24th. Mr. F. O. Stanford).—£23,030 for the extension of the Altham sewage disposal works.—The borough surveyor, Mr. G. H. Pickles, giving evidence, dealt with the proposed extension of the works and [illegible] The [illegible] present [illegible] meeting the increases generally in tenders.

Leyton U.D.C. (March 19th. Mr. M. K. North).—£460 for the purchase of land for the widening of Church-road, Leyton, and £1,650 for the construction of underground public conveniences at the junction of Church-road and Lea Bridge-road.—There was some opposition to the road widening scheme on the ground, as alleged, that it was proposed for the wrong side of the road. No opposition was offered to the proposed underground convenience.

Pontefract T.C. (March 31st. Mr. P. M. Cross-[illegible]) £21,000 for [illegible] disposal.—It was stated that in 1902 the corporation spent £14,000 on the present works in the hope of dealing finally with the sewage; but three years ago complaint was made by the West Riding Rivers Board with respect to the effluent running into the Aire, and eventually the board took proceedings in the county court. An order of abatement was made by consent, and the present scheme, prepared by Messrs. D. Balfour & Son, of Newcastle-on-Tyne, was the sequel. Dr. Wilson, who represented the Rivers Board, said he had no criticisms to offer. The scheme would be very easy to work, most economical, and [illegible] some years. In answer to Mr. G. W. Hobman, who represented the Pontefract Rural District Council, Mr. Balfour said that every precaution had been taken to safeguard the main road and the adjoining property from any nuisance. The inspector suggested that the Treasury might object to granting a loan at the present time, whereupon the town clerk said with an expenditure of about £200 the present works might be utilised for another year, and Dr. Wilson said the Rivers Board would not take any steps if the Treasury raised objection.

Sheffield T.C. (March 31st. Mr. H. Shelford Bidwell).—£164,373 for extension of electricity supply works and plant.—The object of the extension, it was stated, was that the corporation might be in a position to supply much-needed assistance to the large armament works which were now engaged at top pressure on Government orders.

Upper Stour Valley Main Sewerage Board (March 31st. Mr. M. K. North).—£1,500 for sewerage purposes. The engineer (Mr. W. Feltham) stated that the length of sewer affected extended from New-street, Quarry Bank, to Cradley Pool, and from Butcher's-lane, Cradley, to New-street, Cradley. It was in all about a mile in length. The sewers were constructed in 1896, but, owing to mining operations, they commenced to subside as far back as 1900, and several lengths had been replaced on various occasions, the cost to the board being about £200 to £400 per annum, which had been paid out of the revenue account. The inspector alluded to the fact that the Local Government Board was opposed somewhat to the raising of loans at the present time, and inquired whether, in the event of sanction being deferred for one year, it would endanger the public health or seriously pollute the river Stour. The engineer replied that such a proposal would not imperil the public health, and he did not think it would seriously affect the river, which had been for some time past a receptacle for a good deal of manufacturing waste. It was desirable, nevertheless, that the work should be proceeded with.

APPLICATIONS FOR LOANS.

Ellesmere Port U.D.C. £5,500 for new municipal offices, and £2,450 for road widening.

Frome U.D.C. £320 for sewer extension.

Leyton U.D.C.—£17,158 for electricity plant.

LOANS SANCTIONED.

Celbridge No. 2 R.D.C.—£4,930 for the provision of cottages.

Foleshill R.D.C.—£14,250 for housing schemes at Foleshill and Bedworth.

Heywood T.C.—£6,440 for the purposes of the electricity undertaking.

Melford R.D.C.—£750 for the erection of houses.

FORTHCOMING INQUIRIES.

APRIL. £

13. **Blackburn.** For the erection of public [illegible] (Mr. Edward Leonard) 9,000

13. **Clacton.** For works of sewerage and [illegible] (Mr. P. M. Crosthwaite) 10,150

13. **Market Weighton.** For the purposes of a hospital (Dr. W. W. F. Fletcher) 400

13. **Wood Green.** For culverting and laying out gardens (Mr. W. O. E. Meade-King) 3,450

14.—**Bognor.** For works of surface-water drainage (Mr. W. O. E. Meade-King) 450

14.—**Gleator Moor.** For the provision of houses (Mr. E. Leonard) 7,000

14.—**Dover.** For the purposes of the electricity undertaking (Mr. H. Shelford Bidwell) 6,000

15.—**Littlehampton.** For refuse destructor and sewerage purposes (Mr. W. O. E. Meade-King) 1,850

21.—**Bolton.** For the purposes of the electricity undertaking (Mr. H. Shelford Bidwell) 45,032

TOWN PLANNING.

14. **Croydon.** (Mr. George L. Pepler)

21.—**Nottingham.** (Mr. Raymond Unwin)

CORRESPONDENCE.

[illegible]
[illegible]
EURIPIDES

INSECTS AND DISEASE.

To the Editor of THE SURVEYOR.

SIR,—In view of the approach of warmer weather, it may be well to draw attention to the fact that much of the clothing of the wounded arriving at Red Cross hospitals is, as one would expect, swarming with lice, and probably many sanitary inspectors have the task of disinfecting the clothes by heat. At present, so far as one hears, there is no typhus in France or Belgium. The war commenced towards the end of the hot weather last year, and the trenches were comparatively clean when the cold weather set in; but the lice are now arriving when insect life will be exceedingly active—one hopes without a corresponding increase of disease.

Lice (so-called) almost certainly are known to convey typhus. Verb. sap. The work of sorting out, brushing and labelling the clothes of the wounded when they arrive at the hospital usually devolves on the quartermaster, while the lot of disinfection belongs to the local sanitary inspector, and it seems only fair to point out that lice should be regarded as conveyers of infection, and that the clothes should therefore be handled carefully.

One may wait in vain for any official dictum on such a point; spoon-feeding and optimistic euphemisms appear to rule the day. It is not so many years ago since certain bacilli found in this country, and identified as plague bacilli, were referred to officially under a long new Latin name to allay public apprehension.

How many lives lost by enteric at the commencement of the Boer War would have been saved if the persons responsible had notified those who were inoculated against enteric that for the first six weeks after inoculation they would be rather more susceptible than normal to enteric?—Yours, &c.,

G. BERTRAM KERSHAW, M.INST.C.E.

9 Victoria-street, S.W.
April 7, 1915.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Cornwall; housing and town planning—Evesham, Ludlow; roads and materials—Barrow-on-Soar, Croydon; sewerage and sewage disposal—Aberdeen, Chertsey; water, gas and electricity—Aberdeen. Particulars of other projected works will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Blairgowrie T.C. — The question of effecting improvements at the public hall is under consideration.

Blyth R.D.C.—A scheme has been approved for additions to the isolation hospital, at an estimated cost of £400.

Bridgwater R.D.C.—The Watchet and Langport Rural District Council are to be approached by this council on the question of the provision of a joint isolation hospital.

Eastbourne T.C. The council have forwarded to the Board of Trade an application for sanction to construct two timber groynes 220 ft. long upon the foreshore below high-water mark, 600 and 900 ft. respectively, south-west of the shelter in the Holywell Pleasure Ground.

Cornwall C.C. —Dr. Clarke, medical officer of health, in a report presented to the Sanitary Committee, proposes that the county council should become the authority for the treatment of infectious diseases by the provision of two hospitals of twelve beds each, at an estimated cost of £2,500. A committee has been appointed to go into the matter.

Leeds T.C.—The corporation have approved the purchase of a site at Hunslet for the erection of a transformer substation.

Lewisham B.C.—The borough council are recommended by the Health Committee to build a tuberculosis hospital.

Leyton U.D.C.—A scheme has been sanctioned for the erection of a temporary fire station in Church road at an estimated cost of £500.

Rowley Regis U.D.C.—It has been decided to build a retaining wall for about 70 yds. in Powke-lane where landslides occurred recently, at an estimated cost of £130.

Tredegar U.D.C.—The report of the surveyor, Mr. W. L. Roach, suggesting the erection of a lavatory and waiting-room at Bedwellty Houses, and alterations to the council chamber, at an estimated cost of £150 has been adopted.

HOUSING AND TOWN PLANNING.

Evesham T.C.—The council have purchased sufficient land to build 150 houses, and a proposition was made last week to ask the Local Government Board for sanction to borrow £11,275 for the erection of fifty-two houses, as a commencement of the scheme. After discussing the matter, however, the council decided to adjourn further consideration of the question till August.

Ludlow T.C.—The Local Government Board have intimated that they would be prepared to sanction a loan for the council's housing scheme, but that for the present the construction of the houses must be postponed.

Newcastle-upon-Tyne T.C.—A tender at £6,828 has been accepted for the erection of workmen's houses in City-road.

Ruislip-Northwood U.D.C. — The council have approved the plans of Messrs. A. & J. Soutar for a housing scheme, and authority is to be sought for the purchase of land and the erection of twenty-two houses.

Woolwich B.C.—The council have accepted from the Office of Works a complete series of the plans of the new garden city at Well Hall for exhibition in the town hall.

PARKS AND OPEN SPACES.

Fleetwood U.D.C.—The surveyor, Mr. E. Frobisher, has been instructed to prepare an estimate of the cost of completing the improvements at the park, including the erection of two shelters and other works.

ROADS AND MATERIALS.

Barrow-on-Soar R.D.C.—It has been resolved to proceed with the making up of Anstey Old Green-lane-road, at an estimated cost of £2,928.

Belfast T.C.—The borough surveyor, Mr. H. A. Cutler, has received authority to proceed with the widening of Shankill-road at Glenwood, where property has recently been acquired under the Belfast Improvement Act, 1911, as soon as the necessary formalities have been completed.

Cambs C.C.—The following tenders for steam rolling have been accepted: Pamplin Brothers, Cherry-hinton, time only, £1 1s. per day; time and distance combined, 1s. 6d. per mile plus 10s. per day; S. E. Covill, Ely (two rollers only), time only, £1 2s. per day; time and distance combined, 1s. 6d. per mile plus 10s. per day.

Chiswick U.D.C. An intimation has been received from the Road Board that they were prepared to make a grant towards the resurfacing of Wellesley-road and Bath road, but suggesting that, if possible, the works should be deferred for the time being. It was stated that the work at Bath-road must proceed, as the contract had been signed. With respect to Wellesley-road, which was being used by the War Office, the surveyor, Mr. E. Willis, said it would be possible to do some temporary repairs in sections.

Cirencester U.D.C.—The Local Government Board having intimated that they would be unwilling to sanction at the present time the loan asked for by the council of £1,000 odd for the purpose of carrying out Bishop's Corner improvement in the Market-place, the council have resolved that the clerk write to the board explaining that the matter was taken in hand a considerable period before the war broke out, and that unless it was now carried through no other opportunity of effecting this great public improvement might recur for many years.

Croydon T.C.—An intimation has been received that the Road Board have sanctioned a grant of £18,950 for the proposed relief road from Thornton Heath to Purley.

Dumfriesshire C.C.—An improvement has begun on the section of the Carlisle and Edinburgh road of which the Langholm District Committee has charge. The road forms part of the main road from London to Edinburgh, and it is expected that the sum of £1,015 will be expended on it this year from the Development and Road Improvement Fund. Large sums will have to be spent in future years, as the scheme will take some time to complete.

Forfar C.C.—The Dundee District Committee have adopted the proposal of the surveyor, Mr. J. B. Roberton, to continue the work of laying a strip of pavement on the footpaths in populous places, and 3,500 lin. yds. would be laid, the same quantity as last year. The cost of pavement would be 4d. per superficial foot more than last year. Experience had shown that the strip of pavement was much appreciated by that section of the ratepayers who used footpaths only. The pavement would probably last twenty years, and always provided a clean place for walking on.

Glamorgan C.C.—At a meeting of the Roads and Bridges Committee letters were read from the Local Government Board and from the Road Board requesting the council to defer, where possible, schemes for the improvement and construction of roads and bridges, stating that no new grant could be made in respect of such works for the present. It was agreed to defer the carrying out of a great number of improvements on hand.

Grimsby T.C. The corporation of Grimsby have received from the Local Government Board a communication stating that at the present juncture they are unable to give sanction for a loan of £1,140 for

paving with granite portions of East Marsh street and East Robinson street, which are at present paved with water-bound macadam.

Hawarden R.D.C. The surveyor, Mr. W. Newton, reported recently that the new streets at Shotton had been completed at a cost of £719, leaving a balance of £46 in hand from the money received for the work. He proposed to tar-spray the streets, and treat them with a coating of chippings, and this and other necessary works would exhaust the whole of the balance. The surveyor was congratulated upon the economy of his methods.

Hursley R.D.C. It is reported that the Road Board have sanctioned a grant of £3,555 for the repair of roads damaged by military traffic.

Manchester T.C.—The council on Wednesday last agreed to the expenditure of £39,700 on the purchase of property in Cross street for improvement purposes.

Rawmarsh U.D.C. It was reported that the county council had acceded to the urban council's application for a grant of £80 towards the cost of the High street improvement. The estimated cost of the scheme is £2,537.

Reigate T.C. It has been agreed to lay wood paving on the approach to Redhill's bridge and Station road, Redhill.

Rugeley U.D.C. The question of widening Hagley road at an estimated cost of between £600 and £800 to meet the increased traffic due to the military camp has been referred to the Highways Committee.

Torrington R.D.C. It was stated at the council meeting on Saturday that in some parts of the district the stone used for road repair was not good enough. Colonel Moore-Stevens observed that it would not stand the lorry traffic. The only thing to do was to get stone which was more serviceable and for which, save money by it. The surveyor, Mr. T. B. Fairchild, said granite was not to be obtainable.

Tredegar U.D.C. An expenditure of £600 has been approved for works of road widening and fencing.

Trowbridge U.D.C.—The surveyor, Mr. H. Lailey, reported recently that he had been unable to get broken stone from anywhere. He had tried three or four places with the idea of procuring it before March 31st, and he had rented a small piece of land with the intention of stacking it until he could get it ready for the roads. It was the same everywhere, and the county council had had to appeal to the War Office to use compulsion because some of their roads were so bad. The chairman said it would be rather remarkable if they could get deliveries as usual in these times. He, however, quite saw the surveyor's difficulty. They might lose the county council grant, or a portion of it. Mr. Waight: Do I understand the difficulty is in getting stone, or stone already prepared? The surveyor: Broken stone from the quarries. There is such a demand for it. Trucks to convey it in are another big item.

SEWERAGE AND SEWAGE DISPOSAL.

Aberdeen T.C.—A sub-committee of the Sewerage Committee has been appointed to confer with the Public Health Committee on the subject of the drainage of the Mannofield district.

Chertsey R.D.C.—The council have approved the plans prepared by the surveyor, Mr. F. W. Greig, for the extension of the Bylleet and Pyrford pumping station, at an estimated cost of £1,947.

Kidderminster T.C.—The Health Committee have been asked to report upon a scheme of sanitation for Foley Park, one of the areas added recently to the borough.

Holmfirth U.D.C. The surveyor, Mr. G. Bray, has been instructed to proceed with the work of constructing a branch sewer in Kirkroyds-lane, and also a coke-breeze filter bed in the council's waste ground adjoining the lane for the treatment of the sewage.

Newry No. 1 R.D.C.—Messrs. P. H. McCarthy, Dublin, and S. Wilson, Newry, have been appointed joint engineers of the new sewerage scheme at a fee of 5 per cent on the cost of the work.

Prestatyn U.D.C.—The council have under consideration plans, sections, and estimates of the main sewerage scheme prepared by the engineer, Mr. Blizard.

WATER, GAS, AND ELECTRICITY.

Aberdeen C.C.—A special committee has been appointed consisting of the chairman of the eight districts of the council, with instructions to confer with the Aberdeen District Committee in the matter of the City of Aberdeen improved Dee water supply scheme. It was explained that it was particularly necessary to consider any question of damage to the roads, because very large contracts were to be carried out, and the council would have to try to endeavour to make some arrangement with the corporation of Aberdeen by means of which any damage should be made good.

Birkenhead T.C.—An undertaking having been given to limit the proposed expenditure during the year under the Corporation Water Act, 1907, to £160,000, it is expected that the necessary sanction to the expenditure of such an amount will be given by the Treasury.

Dundee T.C.—It has been decided to continue the 10s. minimum charge for the use of hose-pipes for garden purposes.

Holywell R.D.C.—With regard to the scheme of water supply for the parish of Llanaser, the clerk stated that the Local Government Board would never give their sanction to borrow the necessary £15,000 at present. The council decided that the scheme should be left over till a more opportune time.

Kirkcaldy C.C.—In connection with the new waterworks, the Kirkcaldy District Committee have decided to grant the contractors, Messrs. Jackson & Anderson, 2d. extra per hour for the men employed provided the number is not under 80, 2½d. per hour provided the number is not under 100, and 3d. per hour provided the number is not under 150.

Liverpool T.C.—The council on Wednesday last adopted the recommendation of the Water Committee for the promotion of a Parliamentary Bill to enable a further instalment of water to be conveyed from Lake Vyrnwy by means of a third pipe line.

Llandudno U.D.C.—In view of the refusal of the Local Government Board to sanction a loan for £2,000 for a necessary increase in the generating plant at the electricity works, the council have decided to pay for the new plant out of reserve fund.

Ludlow R.D.C.—A communication has been received from the Local Government Board stating that they would be prepared to sanction a loan for the Craven Arms water supply, but advising that the completion of the scheme should be deferred.

Midlothian C.C.—Negotiations are in progress for establishing a joint scheme of water supply for Cockpen and Bathgate.

Sandgate U.D.C.—The council have adopted the estimates of the surveyor, Mr. D. V. Howard, at £1,200, for the completion of the waterworks scheme, and the Local Government Board are to be asked to sanction a loan for the work.

Southam R.D.C.—Messrs. Taylor & Wallin, New Queen-square, Westminster, are the engineers of a water supply scheme, the cost of which is estimated at £4,500.

Torquay T.C.—In view of the attitude of the Local Government Board towards a proposed loan of £1,800 for alterations to the electricity generating station and the acquisition of new offices and stores on Victoria-parade, the council have authorised the town clerk to make such financial and other arrangements as might be required to meet the case, in the hope that the application for sanction would be considered at a future date.

MISCELLANEOUS.

Bedale R.D.C.—The surveyor, Mr. T. W. Metcalfe, reported that he had found it necessary to employ 115 additional men at a total cost of close upon £50 in wages for clearing the snow after the recent storm. The snow was so deep in places that the snow plough could not get through.

Colne T.C.—The borough surveyor, Mr. T. H. Hartley, has received instructions to prepare a scheme of cemetery extension.

The Assessment of Dundee Sewers.—Dundee Town Council met recently, when a report was submitted by the town clerk on the proposals to value sewers for income-tax. He said the annual valuation of sewers in Dundee was £8,000, and that on the new 2s. 6d. rate would mean that the ratepayers would in this form have to pay £1,000 a year in income-tax. He expressed the opinion that the subject was not a proper one for income-tax, and that in regard to the matter assessors were not acting with uniformity. It was decided to take any steps necessary to safeguard the council's interests.

PERSONAL.

Mr. W. Fowlds, borough engineer and surveyor of Keighley, has received an increase of salary.

Mr. F. Howarth, collector to the Altrincham Urban District Council, is with the Army Service Corps.

Mr. G. Lapwood, highway surveyor to the Romford Rural District Council, has been voted an increase of salary.

Mr. Herbert C. Jeffs, clerk to the Altrincham surveyor and medical officer of health, is serving with the Army Service Corps.

Mr. B. Richardson, assistant surveyor to the Sunderland Rural District Council, has had his salary increased by £25 a year.

Mr. Frank A. Williams, A.R.S.I., sanitary inspector to the Altrincham Urban District Council, has joined the Army Service Corps, and is now in France.

Mr. David Galloway, borough engineer and inspector of Inverkeithing, who joined the Royal Naval Division, has been appointed Lieutenant.

Mr. K. J. Foster, assistant surveyor at Chelmsford, has been appointed highway surveyor to the St. Germans Rural District Council, at a salary of £120 a year.

Mr. C. Benyon, highway surveyor to the Cheltenham Rural District Council, has been appointed to a similar position under the Abingdon Rural District Council.

Mr. C. G. Atkinson, P.A.S.I., assistant surveyor to the Wellingborough Urban District Council, has been appointed temporary surveyor to the Cheltenham Rural District Council.

Mr. L. Holme Lewis, engineer and manager of the hydraulic power department, was on Wednesday last appointed engineer to the Manchester Corporation waterworks department, at a salary of £850 a year.

Mr. George Jones, surveyor to the Llanfrechfa Upper Urban District Council died recently, we regret to state, and the council have passed a vote of condolence with the widow. He had served the council, it was stated, faithfully and zealously for nearly fourteen years.

Mr. William John Cook, surveyor to the Aylesbury Rural District Council, who has retired owing to ill-health, has received from the council a resolution "recording their appreciation of the twenty years' service rendered by him as surveyor," and expressing the hope that he may live many years to enjoy his retirement.

FOR OTHER ADVERTISEMENTS
See End of Paper.

RURAL DISTRICT COUNCIL OF MUTFORD AND LOTHINGLAND.

TENDERS FOR GRANITE.

The Council invite Tenders for the Supply of Granite during the period ending 31st March, 1916.

Forms of Tender and further information may be obtained of the Council's Surveyor, Mr. H. Blewitt, Council Offices, Oulton Broad, Lowestoft.

Sealed Tenders, marked "Tender for Granite," and Samples of Granite must reach me not later than 12 o'clock noon on the 20th inst.

The Council do not bind themselves to accept the lowest or any Tender.

W. BRYAN FORWARD,
Clerk.

148 London-road N.,
Lowestoft.
April 7, 1915. (2,530)

GOSPORT AND ALVERSTOKE URBAN DISTRICT COUNCIL.

Tenders are invited for the conversion of a pair of 18-in. stroke horizontal cross high-pressure, independent condensing, tandem-driven, double-acting Air Compressors, fitted with silent-running, mechanically operated air compressor inlet and delivery valves, into two pairs of horizontal cross compound independent condensing, and tandem-driven, double-acting Air Compressors, fitted with silent-running, mechanically operated Air Compressor inlet and delivery valves, with all necessary valves, pipe connections, foundations, &c. A copy of the Specification, Plan and Form of Tender may be obtained from the Surveyor to the Council on receipt of a Guinea (returnable). Tenders, addressed to the Clerk to the Council, and endorsed "Tender for Compounding Air Compressors," to be delivered at the Council Offices at or before Noon, May 13th.

The Council do not bind themselves to accept the lowest or any Tender.

H. FROST,
Engineer and Surveyor to the Council.

Gosport.
April 7, 1915. (2,527)

NEWMARKET RURAL DISTRICT COUNCIL.

TENDERS FOR ROAD MATERIALS.

The above District Council invite Tenders for the Supply of the following Road Materials to be delivered at the following Railway Stations—viz.: Six-mile-bottom, Dullingham, Newmarket, Kennett, Swaffham Prior, Bottisham, Burwell, Fordham, Soham and Isleham (G.E.R.), at such times and in such quantities as may be ordered by the Council or their Surveyor:

6,000 tons (more or less) of 1¼-in. to 2-in. gauge Best Broken Leicestershire Granite and ¼-in. Chips.
1,000 tons of Slag.

Tenders, on Forms to be obtained at my Office, to be returned to me, with Samples, marked "Tender for Road Materials," not later than 10 a.m. on Tuesday, the 20th day of April instant.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

FRED. J. BLACKBOURN,
Acting Clerk to the Council.

Deva Chambers, Newmarket.
April 6, 1915. (2,528)

COLOMBO MUNICIPAL COUNCIL, CEYLON.

APPOINTMENT OF ASSISTANT ENGINEER.

The Colombo Municipal Council requires the services of an Assistant Engineer who has a general knowledge of Municipal duties and, in particular, of Waterworks.

Candidates should be unmarried, and not more than 30 years of age, and must have been articled to a Civil Engineer, and obtained experience on some Waterworks of importance, and possess a thorough knowledge of all works pertaining to Waterworks Engineering, and also of Municipal Engineering in general.

Salary Rs.4,500/- per annum, with a commuted allowance of Rs.900/- per annum.

The selected candidate will be required to pass a medical examination by the Consulting Physician to the Colonial Office.

The gentleman appointed will be required to enter into an agreement to serve the Municipal Council for a period of three years in the first instance.

Passage to Ceylon (first-class by a mail steamer, or second-class by a mail steamer) will be provided, and half salary will be paid during the voyage out.

Should the services of the officer be not required at the expiration of the three years for any reason other than misconduct, or should the officer desire to terminate the appointment, a free passage to England will be provided by the Council.

Letters of application, stating age and qualification, and accompanied by copies only of recent testimonials, should be forwarded to R. Eustace Tickell, Institution of Civil Engineers, Great George-street, Westminster, and must be received not later than 1st day of May, 1915.

Envelopes enclosing applications must be endorsed "Assistant Engineer, Colombo."

(By order)

E. H. JOSEPH,
Secretary, Municipal Council.

The Municipal Office,
Colombo. (2,529)

ENGINEER'S or Surveyor's Assistant requires situation; 12 years' experience; architectural, engineering and surveying experience; P.A.S.I.; moderate salary.—Box 2,519, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C. (2,531)

FOR SALE.—A Leicestershire Granite Quarry in full working order.—Apply, Bland, Carryer & McAlpin, 6A St. Martin's, Leicester. (2,532)

The Treatment of Waste Liquors from Bleach, Print and Dye Works.—(VIII.)

By G. BERTRAM KERSHAW, M.A.M.SOC.C.E., M.INST.C.E., Late Engineer to the Royal Commission on Sewage Disposal.

Although these [illegible] chiefly [illegible] Lancashire, Yorkshire, [illegible] other districts, [illegible] but with an [illegible] parts of the country. A [illegible] are carried on in the same premises.

The substances [illegible] rather widely, according to the material which is being dealt with and the [illegible] at a particular mill.

Very large quantities of wash waters are [illegible] with be gathered from the processes through which the cloth passes, and which are described below.

BLEACHING.

The pieces [illegible] kiers containing milk of lime [illegible] to remove the weavers' size which is added to the cotton thread before weaving; the cloth is then washed, "soured" with dilute acid (grey sour), and again washed; it is then again boiled with soda ash and [illegible] solution, which [illegible] and washed.

The kier liquors are exceedingly alkaline and impure, containing [illegible] starch and gummy substances; they are generally mixed with waste liquors from the print and dye houses. Dealt with by itself, it is a most difficult liquid to treat, since it would not pay to recover the soda by evaporation, as is the case with the liquors from esparto boiling in the paper-making industry, and, if mixed with the other bleaching liquors, arrangements should be made to run the kier liquor gradually into the other liquors from a storage tank.

The plan of adding septic sewage sludge to this type of refuse has been tried as a preliminary to artificial filtration, thereby carbonating the caustic alkali, with somewhat disappointing results as regards the type of effluent produced, while the bulk of sludge to be disposed of is increased.

The following figures, [illegible] as representative of a typical soda kier liquor:—

	Parts per 100,000
Ammoniacal nitrogen ...	20
Total	175
Oxygen absorbed from permanganate in four hours at 80 deg. Fahr. ...	75
Total solids...	900
Caustic alkalinity	220
Dissolved oxygen taken up in five days at 60 deg. Fahr. ...	68

Schiele, speaking of kier liquors derived from bleaching, mentions that superficial purification can be obtained by storing the alkaline liquors in reservoirs, and mixing the acid liquors gradually with them, after which the mixed liquors are clarified in settling tanks. It is stated that the liquor so dealt with can be treated by biological [illegible]

Keller, of Stuttgart, re-uses the alkaline liquors, adding dissolved or undissolved lime to them, with constant stirring, by which the liquid assumes a brighter colour. The liquor decanted from the lime is then re-used as it is or further concentrated.

In this country the usual treatment in use for the mixed liquors is settlement, sometimes with a precipitant, such as alumino-ferric, followed by straining filters. It would seem to be helpful if the alkalinity of the kier liquors were neutralised before discharge by the acid liquors contained in the other wastes.

It may be mentioned that cotton waste from spinning mills, destined to be utilised in the manufacture of gun-cotton, also undergoes a bleaching process, being subjected to boiling with a dilute solution of caustic soda, after which it is bleached.

In the case of greasy cotton wastes it is usual to treat them before kiering to a process devised to extract the grease.

PRINTING.

There are many methods of printing in use at the present day. The colouring substances used for printing are [illegible] paste [illegible] gum, starch flour, or some other glutinous loading, to cause the colour to adhere to the printing rollers. These are made of copper, and are engraved with the design which it is desired to imprint on the fabric. Some printing machines have several of these rollers, each being engraved with a portion of the pattern to be printed, and each roller being supplied with a separate colour. The rollers revolve in a trough containing the colour paste; all the colour, however, with the exception of that lying in the engraved portions of the roller, is removed before coming in contact with the fabric by a steel scraper, technically termed a "doctor," running the whole length of the roller and just touching it. The cloth when printed is passed through a hot soap solution and afterwards washed. In many cases mordants are used.

A large quantity of clean water is required in the printing industry, not only for washing the printed cloth, but also for washing the engraved copper rollers, colour vats, &c., and the waste waters from a print house are highly coloured, soapy liquids, resembling the wastes from a dye house, but containing more suspended matter. The suspended matter, as would be anticipated, is mainly inorganic, and the amount of dissolved oxygen taken up by dye wastes is not very great, some 10 parts per 100,000 being perhaps a usual figure for five days at 60 deg. Fahr.

Concerning the treatment of wastes from the print house. These are generally mixed with the wastes from the bleach and dye houses, and treated by means of settlement in tanks. Precipitants are usually employed, and in most cases the tank liquor is passed through rather shallow cinder or clinker filters; the filtration, however, generally partakes of the nature of mechanical straining, owing to the excessive rate at which these filters are almost invariably worked.

It should be noted that a somewhat heavy dose of precipitant is often needed prior to tank treatment, owing to the presence of soaps in the waste liquors.

Very large quantities of sludge are produced, and this is chiefly disposed of by tipping on waste ground. It appears to possess little, if any, manurial value.

DYEING.

In this process the dyes formerly used were obtained from infusions of various woods; at the present time, however, aniline dyes have almost entirely superseded the dyes extracted from woods, and—as will be gathered from the correspondence in the newspapers during the past few weeks regarding the aniline "dye scheme"—the bulk of this industry of preparing aniline dyes is in the hands of the Germans at the present day, and it appears likely to remain there, judging from the lack of success which usually attends any industry with which the Government of this country meddles.

The processes of dyeing used vary very much in detail, and it is not necessary for present purposes to enter into all these details.

The direct dyeing process may be described generally as passing the cloth to be dyed through a vat containing a hot solution of dye, after which it is treated with a starch solution and washed. In the indirect dyeing process mordants are used, and the dyed cloth is finally washed in large volumes of clean water. The more delicate the tint of dye required in the finished cloth, the cleaner must be the water employed for washing purposes.

The waste waters produced during the process of dyeing are very variable in character, and are usually highly coloured and acid; they also contain, as a rule, many solids, both in solution and in suspension. The contents of some of the vats are frequently quite hot when discharged, and when the discharge takes place into town sewers, nuisance from smell is likely to arise.

The following figures, taken from an analysis made by Mr. Ed. Halliwell, F.I.C. (Seventh Report, Royal

Commission on Sewage Disposal, Vol. III., Part II., p. 430, shows the nature of crude aniline dye waste:

	Parts per 100,000
Ammoniacal nitrogen	·65
Organic nitrogen	1·03
Oxygen absorbed in three minutes ...	17·5
Oxygen absorbed in four hours	64·6
Suspended solids	252·
Oxygen absorbed in three minutes, after incubation	14·4
Odour	No H_2S

Regarding the treatment of the waste waters, chemical precipitation, followed by filtration, reduces the colour somewhat at first, but some dyes are very persistent and difficult to remove, and heavy doses of precipitant are apt to increase the hardness of the effluent, to the detriment of users of the water lower down the river or stream.

When, as is often the case, the waste waters from the bleach, dye and print houses are mixed together before treatment, the acid dye waters tend to neutralise the alkaline kier liquors from the bleach house, and mixing is useful for this reason.

It should be added that where genuine indigo is used as a dye, most dyeworks have a special plant for treatment of the waste waters, and the indigo sludge is re-used.

Large quantities of sludge are produced in the drying processes, and so far no use appears to have been found for it other than the filling up of waste land.

At one very large dyeworks with which the writer is acquainted the sludge is conveyed along an elevated wire ropeway to a large valley adjoining the settling tanks, and many thousands of tons of semi-dry sludge have been tipped here, gradually filling up the valley.

At some works the liquid sludge is run on to steam straining beds, formed of a bed of cinders 9 in. to 12 in. or more in depth, the sludge being removed by spade labour when sufficiently dry to manipulate.

It may be noted that the colour resulting from the use of certain dyes is extremely difficult to remove from the waste waters, and also from a sewage which contains them in any quantity, and in this connection the writer has noticed that really good land appears to be far more efficacious in removing the colour than either contact beds or percolating filters.

At the Nottingham Corporation sewage farm large quantities of dye frequently reach the sewers from the dye houses in the Leen Valley; but, although the dye on occasion shows very plainly in the liquid in the carriers on the farm, it is never seen in the effluents after they have passed through the land.

It is quite possible that some as yet little understood action may occur with some soils and subsoils, which is less pronounced, or even altogether absent, in the case of artificial filtering media.

As with brewery wastes, dye waters should not be discharged at a high temperature into town sewers, or nuisance from smell is probable.

Tieneman has recently stated that many colouring substances, although non-poisonous to men, have a strongly poisonous action, even when highly diluted, upon very varied species of organism in water. Victoria blue, methyl violet, charcoal black, and diamond green B have been found to prove particularly fatal to fresh-water organisms, and they may therefore be indirectly harmful to fish, by destroying the lower organisms in the water upon which the fish mainly subsist.

It is well known that many dye wastes contain mordants which are directly [illegible] to fish-life.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law. A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is not the city of Exeter to be congratulated on having broken down the fetish of always accepting the lowest tender for the execution of public works? Have there not been frequent cases where local influence and prejudice have been the means of tenders being accepted from persons possessing neither the plant nor the experience necessary for the carrying out of particular works, with the result that the surveyor has had an evil time while the works were in progress, and litigation and great expense have often followed?

* * * *

Why is Paddington the only station in London that was properly designed for the comfort of the passengers and the speedy disembarking of luggage? Is it not rather curious that Victoria, which is one of the latest designed stations, should be so hopelessly inconvenient, especially at times of any extra traffic?

* * * *

What will be the general opinion among sanitary engineers of the recently issued Final Report of the Royal Commission on Sewage Disposal? Should we not feel very grateful that what was at one time chaos has been brought into something like order, and that the sixteen years' work of the commission has not been in vain? Whether we shall agree or not with all the recommendations remains to be seen, but will not the study of all the reports, including the Final Report, give us an opportunity of acquiring a mass of knowledge on the interesting and complicated problems of sewage disposal?

* * * *

Have not surveyors good cause to envy skilled mechanics at the present time when we hear from the newspapers that they are earning something like £6 a week for four days' work? Are there many surveyors in the country who can command such salaries, and at the same time take 104 days' leave during the year in addition to the legal holidays?

* * * *

What will eventually be done with the Belgian roads, which are reported to be now ploughed up by the German men of "kultur"? Does it not become more and more evident that English road engineers will be required to set things right eventually in that devastated country?

* * * *

Why is it that the *men* in the trenches have not struck because they can't get Easter leave and time off on Sundays? Who would have thought, at the commencement of the war, that the only allies the Germans could command, in addition to Austria, were some of the "working men" of this country?

* * * *

Have not some of the "thousands" recently published in the papers shown that high wages are synonymous with idleness? And what is to be the remedy?

* * * *

Does not the "house list" for balloting for members of the council of the Institution of Civil Engineers rather indicate that municipal engineers and surveyors are not required? Why cannot the municipal engineers of this country form a "trades union," and combine in the endeavour to receive more recognition?

The Civic Engineer's Who's Who, compiled by the editor of The Surveyor and Municipal and County Engineer, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier.*

G.P.O. and District Council.—Judge Smyly, at Bow County Court, recently decided a dispute between the Postmaster-General and the Leyton Urban District Council. The Postmaster-General desired to place at various points on the public way ten poles for the purposes of carrying telephone wires, but the council contended that the wires should be conveyed underground, and also alleged that the erection of the poles at the points suggested would lead to a nuisance. The judge made an award in favour of the Postmaster-General, subject to the conditions that the poles should be placed as near the kerb as the safety of the traffic would permit.

BUILDING AUSTRALIA'S CAPITAL CITY.

Work is proceeding substantially in connection with the construction of Australia's capital city, Canberra. Extensive [illegible] being formed 3 miles outside the city boundary. A site has been selected for the construction of a dam to [illegible] the water from the Queanbeyan River, in order to force a continuous stream into the Molonglo, which flows through the Federal capital territory. The cost of the dam will be about £80,000. On the Cotter River, 20 miles from Queanbeyan, a dam [illegible] is erected to store water for the supply of the capital. Although the rainfall has been light [illegible] mated there was a flow sufficient to supply Melbourne. From this dam the water is run in pipes through a tunnel cut in the hill to a big reservoir at Red Hill.

The electric power plant, which will generate sufficient power for lighting and industrial purposes in the city, and is to cost £60,000, is approaching completion.

Extensive nurseries contain large plots of healthy trees, which are to beautify the streets and avenues of this model city, and the work of actually laying out the capital may be expected to proceed without much delay. The Australian Government has acquired an area of 900 square miles, to be known as the Federal Capital Territory. This land is to be held by the Commonwealth and leased to occupants.

LONDON SANITARY COMPANIES AND THE WAR.

The two London Sanitary Companies are going strong. Originally limited to an establishment of five officers and a hundred men apiece, they have already sent more than twice as many to the Front, and have now as many more awaiting orders.

During the early months of the war the Sanitary Companies were completing their training at Chelsea, without any ideas as to how, when, or where they would be employed; but, in spite of this uncertainty, men from the various branches of the public health service of the country came forward eagerly to fill the ranks of the companies. Their faith has been more than justified, for to these two companies, Territorials though they are, has been entrusted the important duty of looking after the sanitary welfare of the troops at the Front, a sanitary section, under an officer, being attached to each division.

Interesting letters describing their work and experiences are now coming to hand from the men of these sections. The work varies in different divisions, but it is gratifying to note that it is by no means confined to the rougher sanitary duties, which are for the most part discharged by fatigue parties from the combatant units. The skilled personnel of the Sanitary Sections is largely employed in special work, such as the inspection of camps and billets, disinfection, building incinerators, and, most important of all, the sterilisation of the water supplied to the troops. Another duty closely affecting the comfort of the men in the trenches is that of making provision for drying their clothes, and giving them baths.

The men of the Sanitary Section have to camp in a bit, like the rest, but they are well fed, and, judging from their own account of themselves, they are having the time of their lives.

Their work is winning high commendation from the powers that be, and its results are seen in the wonderful healthiness of the troops. The drop from 57,684 cases of enteric in South Africa to just over 600 so far in the present campaign is an eloquent tribute to the efficiency of the preventive measures of which the work of the Sanitary Companies forms a part.

Authority has now been given for the formation of a fourth unit of each of the parent companies, and recruiting is now actively in progress for these, and to fill the gaps in the existing units due to the despatch of sections to the Front. We drew attention last week to the needs of the 1st London Sanitary Company. We are pleased to learn that the ranks of the 2nd London Sanitary Company are fast filling up, but there are still vacancies for a few qualified men, who must be prepared to take the Imperial Service obligation. Intending recruits should communicate forthwith, personally or by letter, with O.C., 2nd London Sanitary Company, or with O.C. Depot, Medical Units, 2nd London Division, Duke of York's Headquarters, Chelsea, S.W.

The [illegible] Medical Corps, it is naturally desired that it shall be officered, as far as possible, by medical men. We are, however, pleased to note that commissions have recently been granted to Mr. Herbert Beeney, surveyor to the Chertsey Rural District Council, and to Mr. E. Brooke Pike, chemist-in-charge of the northern outfall works of the London County Council.

BALLAD OF THE [illegible] LONDON SANITARY COMPANY.

(1)

[illegible]
Hurry up [illegible] your lot
Say Goodbye [illegible] Mary,
Cheer ahoy! [illegible]
Somewhere [illegible] France [illegible]
Bring [illegible]
Where the [illegible]
Kaiser Bill what they can do.

(2)

Well! we're ready, fit, and willing,
Glad the day has come around,
For we're just fed up with drilling,
And we're [illegible]
We [illegible]
[illegible]
All the [illegible] that knock
Into cocked hats in a day.

(3)

We are [illegible] that water
Must be purified and still to drink,
And to make it safe we sterilise
A pint to a gallon consumers' tank.
Diagrams we've drawn and studied
[illegible]
We can drain a field that's flooded,
Count the germs on legs of flies.

(4)

We can [illegible]
Sink [illegible] and wells,
We're the [illegible] installers
Of the [illegible] smells.
We can [illegible] with the ladies,
Fix a broken leg in splints,
[illegible]
[illegible]

(5)

[illegible]
Of the [illegible] are our lot.
Not much scope for deeds of glory,
Oh [illegible]
But as [illegible]
"Fall in" there, and pack your kit;
[illegible]
After we have "done our bit."

W. J. A. J.

Town Planning Institute.—At a meeting of this body to be held on Friday next, the 16th inst., at 92 Victoria Street, S.W., Mr. W. T. Lancashire, M.INST.C.E., the city engineer of Leeds, and Mr. H. V. Lanchester, F.R.I.B.A., will open a discussion on "Replanning and Redevelopment in Existing Centres." The chair will be taken at 8 p.m.

A New Urban District Council.—Spenborough, the new West Riding urban district, came into existence officially last week. It is formed by the amalgamation of Cleckheaton, Liversedge, and Gomersal, and constitutes the largest urban district in Yorkshire. The total area is 5,170 acres, and the total population, according to the last census, 31,321, made up as follows: Cleckheaton, area 1,755 acres, population 12,867; Liversedge, 2,316 acres, population 14,658; Gomersal, 1,099 acres, population 3,796.

A Rhyl Pier Scheme.—The *Liverpool Post* states that, after many months of delay, the Rhyl Urban District Council are now in a position to do something with their pier. Plans have been prepared by the surveyor, Mr. A. A. Goodall, and the estimated cost is £4,300. It has been decided to apply to the Local Government Board for the loan, and for a sum to cover the purchase price (£1,000), as well as the costs of the litigation which arose over the first scheme.

Dewsbury Corporation and Trade Effluents.—When the Dewsbury Corporation Bill was before the Local Legislation Committee of the House of Commons the trade effluent clauses were endorsed by all firms except laundry proprietors. It was argued on their behalf that laundry effluent was only like washerwomen's soapsuds, and that it was "domestic" and not trade effluent. The Chairman announced that the Committee's decision was against the Laundry Association.

Vide Captain Caley on "The Lower Forms of Life."
† Some may prefer "Johnny Walker;" it is a matter of taste.

PUBLIC BATHS.

TAUNTON CORPORATION'S SCHEME.

The subject of public baths came before the recent South-Western District meeting of the Institution of Municipal and County Engineers at Taunton in a paper submitted by Mr. D. Edwards, Assoc.M. Inst.C.E., the borough engineer and surveyor. The corporation are embarking on a scheme of public baths, and Mr. Edwards exhibited to the members plans of the proposed buildings, afterwards proceeding to make the following observations:—

The scheme consists mainly of a swimming bath 75 ft. long by 35 ft. wide, being of sufficient width for polo playing, with a depth of water 3 ft. 3 in. and 5 ft. 6 in. at the ends, and a depth of 6 ft. 9 in. 18 ft. away from the deeper end, for diving purposes. The clear width of the gangways is 5 ft. 8 in. from front of dressing boxes to edge of bath. There are forty dressing boxes provided, each 3 ft. 9 in. by 3 ft. 9 in., and two foot baths. At the entrance end there is a space of 18 ft. 6 in., sufficient for the erection of a temporary platform for the witnessing of galas, &c. Subways are provided under one long gangway and one short one, for the purpose of laying and maintaining pipes. The water will be heated by steam injection of the circulated water. There is no provision for boilers necessary, as the steam will be supplied from the electric light works close by, and supplied at a pressure of 150 lb., which, of course, will have to be reduced to about 15 lb. There are six slipper baths provided in such a position that three can be used by the particular sex not using the swimming bath at the particular time and without entering the swimming bath hall, while the other three can be used by the other sex.

Coming to the actual construction of the walls of the swimming pond, many baths lately have been built in reinforced concrete, but the cost of such construction, in my opinion, is greater than ordinary 4 to 1 cement concrete. The walls built in this way have to be about 3 ft. 6 in. thick at the bottom if the depth of water is 6 ft. 6 in., and, in addition to less cost, there is greater reliability of watertightness. This is an important factor in the construction of baths, especially if the ground upon which it is built is not of a solid nature.

It is a question of some little doubt in my mind whether it is necessary to incur the expense of lining the pond with a layer of asphalt, although I have known some baths where this has been considered necessary.

There are several minor details which should be considered of considerable importance, from the point of view of utility and economy. For instance, it is questionable, in my mind, whether it is necessary to provide doors to the dressing boxes. Usually these are constructed to a height of about 4 ft. 6 in. I do not think the expense is warranted. Of course, there are good reasons for the provision of doors to the dressing boxes in a bath reserved only for adults, but, where boys are concerned, it is advisable that they should be under observation in some instances, and the chances of pilfering are greatly reduced by the fronts being open. It is proposed in this scheme to reserve one set of boxes (for adults) with doors of the usual height, and the remainder (for boys) without doors.

The expenditure allowed is £3,000, exclusive of the purchase of the site.

The Chairman (Mr. F. Parr, Bridgwater) said the scheme appeared to be one which could be relied on. There was nothing in it which one could find fault with. At Bridgwater they had open baths, the water being taken from the stream, and they had no end of trouble—in fact, the water was not as it should be for bathing purposes. He had pleasure in proposing a hearty vote of thanks to Mr. Edwards for his valuable paper.

Mr. F. W. Jones (Frome), in seconding the vote of thanks, remarked that the number of slipper baths seemed insufficient.

Mr. S. Hutton (Exmouth) asked Mr. Edwards if he had any reason for placing the deep end of the bath at the entrance.

Mr. Edwards: No special reason.

Another member asked if it was necessary to have 3-ft. walls.

The vote of thanks was carried with acclamation.

In replying, Mr. Edwards stated that no provision was made in the scheme for a gallery, but there was sufficient space to accommodate 250 persons by utilising the spacious gangways which were provided round the baths. As regards the height of walls, the height was 20 ft. to the eaves, which he considered was the minimum allowed for public baths. The number of slipper baths was undoubtedly too small, but the cost would not admit of a larger number just at present.

THE "SIMPLEX" CHEMICAL FIRE EXTINCTEUR.

Probably few of the many varieties of chemical fire extinguishers before the public can claim much conformity with the rules laid down for these appliances by the fire offices and British Fire Prevention Committee. Failure to withstand pressure at the moment of operation—through choking, the effects of rust and corrosion, or inherent weakness of construction—is the common drawback. As there is no doubt that these small hand fire engines, when properly designed and constructed, can often prove of enormous value, it is a matter for congratulation that Messrs. Mather & Platt, Limited, of Park Works, Manchester, have devoted their attention to them, and have produced an appliance that they claim can be depended on under all conditions.

The form of "Simplex" extincteur now made by Messrs. Mather & Platt, Limited, has been specially designed to meet the requirements of the British Government, who have placed with the firm an order which is believed to be the largest ever given for fire extincteurs in this or any other country. The type of extincteur which Messrs. Mather & Platt are now putting on the market is identical with the Government appliance in every detail with the sole exception of the Royal cipher.

The "Simplex" extincteur depends for its operation on the reaction of sulphuric acid upon a bicarbonate of soda solution. The acid is contained in a hermetically sealed bottle suspended over the liquid, which is discharged through the jet upon smashing the bottle by striking a knob at the top of the extincteur. The fluid, which has great extinguishing power, is ejected to a distance of 50 ft. to 60 ft.

In this appliance there are no valves or rubber hose, while the jet orifice is protected from glass splinters or other foreign material by a cone-shaped sieve. An opening at the top, 3 in. in diameter, is provided, through which the acid bottle can be withdrawn should it be desired to examine the interior.

The body of the extincteur is constructed of 16s S.W.G. steel, and tested hydraulically to a pressure of 350 lb. It is coated thickly with lead in the centre and with tin at the top and bottom, both inside and outside, to prevent corrosion, and every seam is riveted as well as soldered. The chemicals with which the machine is charged undergo no change, and the extincteur will operate as satisfactorily after ten years as on the day on which it was first charged.

Messrs. Mather & Platt have just issued a catalogue relating to their fire extincteurs; copies can be had on application.

Successful Boring for Water at Howden.—Satisfaction is felt in the Howden rural district at the successful results of the experimental boring for water at South Newbald. At first the boring results were discouraging, but they were persevered with, and now a copious and ample supply has been secured. The water, which is filtered through the chalk, is of great purity. According to an estimate made some time ago, the water supply scheme for the district will cost about £60,000. The scheme will not be proceeded with until after the war.

A CHAIR OF CIVIC DESIGN AT THE UNIVERSITY OF LIVERPOOL (FACULTY OF ARTS).

[The council of the University are inviting applications for this Chair, which is associated with the School of Architecture, and in view of the important nature of the proposed appointment as municipal engineering work we give below the following details (as altered) as furnished by Mr. Edward Carey, the registrar.]

(1) The duties of the Professor will commence and the appointment date from October 1, 1915. The appointment will be for four years, the period during which the endowment of the Chair is secured.

(2) The stipend of the Chair is fixed at £400 per annum. The Professor will be allowed, but not required to become a contributor to the superannuation scheme.

(3) The Professor will be required to work during the Autumn and Lent terms of each session, from the beginning of October to about the end of March, with three weeks' vacation at Christmas. He will be responsible for the encouragement of research into the problems connected with the design and development of towns, and research being held to include the production of drawings of schemes for the treatment of specific problems, as well as critical and historic surveys of existing work; (b) the publication of the results of this research; (c) the guidance and supervision of research students in the subjects of the Chair. It is also such part in the degree and other examinations of the University as in the opinion of the Professor and on the recommendation of the Senate and the Faculty of Arts, may determine, and to hold or be responsible for such terminal examinations in the Faculty of Arts as may be

(4) A lecturer, also holding a Research Fellowship, is associated with the work of the department. There are several special lecturers taking single courses of lectures.

(5) The Professor will be allowed while in residence to carry on the practice of his profession on conditions already determined by regulations. Such work, however, must be undertaken only to such an extent as shall not interfere with the duties of the Chair.

(6) Candidates are expected to give a detailed statement of schemes already executed or projected by them, to accompany it with plans and state age and to supply details of published or written work.

(7) Applications, together with the names of three persons to whom reference may be made, and twelve copies of not more than six testimonials, should be forwarded to the undersigned on or before May 10, 1915. Original documents should not be forwarded.

STOCKTON BOROUGH ENGINEERSHIP.

Applications numbering 126 were received for the post of borough engineer of Stockton, and the following have been chosen for a personal interview in committee, with a view to the selection of one of their number for submission to the town council: Mr. G. H. Whittaker, Assoc.M.Inst.C.E., chief assistant, borough surveyor's department, Sunderland; Mr. H. R. Crabb, Assoc.M.Inst.C.E., borough engineer, Pembroke Dock; Mr. F. Wilkinson, Assoc.M.Inst.C.E., deputy borough engineer, Wimbledon; Mr. F. G. Beaumont, deputy surveyor, Wolverhampton; Mr. T. P. Frank, Assoc.M.Inst.C.E., borough surveyor, Newark; and Mr. G. C. Mitchell, assistant borough surveyor, Stockton.

The salary is £500 a year, rising by annual increments of £25 to £700.

Remaking of Belgium Exhibition. — Mr. Frank Brangwyn has prepared a striking poster for this exhibition, which will take place at University College, Gower-street, W.C., during the present month. The Right Hon. Viscount Bryce, O.M., has promised to open the exhibition at 4 p.m. on April 7th. Study circles for Belgian architects, engineers, and lawyers who will be engaged upon actual town plans later on will be started at the same time. Invitations to the opening ceremony may be obtained from Mr. Ewart G. Culpin, secretary, Exhibition Committee, University College.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President: Mr. J. S. Pickering, M.Inst.C.E., Borough Surveyor and Water Engineer, Cheltenham.

EASTERN DISTRICT.

An Eastern District meeting is to be held at the offices of the institution, 92 Victoria-street, to-morrow (Saturday), at 3.30 p.m.

Agenda.

1. To confirm minutes of previous meeting.
2. Discussion on use of bituminous material (continued).
3. Discussion on "Heavy Traffic."
4. Any other business.

J. A. Wild,
Hon. District Secretary.

Great Stanmore.

EAST MIDLAND DISTRICT.

An East Midland District meeting is to be held at the Town Hall, Loughborough, to-morrow (Saturday).

Programme.

2.15 p.m.—The members and visitors will be received in the Council Chamber by the Mayor of Loughborough (Mr. W. W. Coltman, J.P.).

2.30 p.m.—To receive minutes of last meeting.
To elect district committee.
To discuss election of district representative, district chairman, and district secretary.
To consider any other general district business.

3 p.m.—Proceed in conveyances (at a charge of 1s. per person) to inspect the swimming baths, where members will be given the opportunity of inspecting an apparatus for teaching swimming, erected by Messrs. Herbert Morris, Limited, of Loughborough.
Proceed to sewage farm to inspect refuse destructor and other works.

5 p.m.—Arrive at town hall, where tea will be provided by the borough surveyor, Mr. A. H. Walker, Assoc.M.Inst.C.E.

E. H. Crump, Assoc.M.Inst.C.E.,
Hon. District Secretary.

Hinckley.

INSTITUTION OF MUNICIPAL ENGINEERS.

President: Mr. W. H. Matthews Jones, City Engineer and Surveyor, Chester.

COUNCIL MEETING.

At a meeting of the council, held in London on March 26th, the following applicants were recommended for admission:—

To Membership: Messrs. A. R. Heritage, highway surveyor, Cookham Rural District Council; W. Ellis, engineer and surveyor, Barnoldswick Urban District Council; L. Taylor, building surveyor, &c., Saddleworth Urban District Council; and G. G. Forster, deputy borough engineer, Middlesbrough.

To Associate Membership: Mr. J. W. Nelson, surveyor, Westmorland Rural District Council.

New Members, &c.—From the applicants recommended for admission at the last meeting one member and two associate members were elected.

Departmental Committee on Building By-laws.—In response to the request of this committee of the Local Government Board, a memorandum embodying the views of the institution has been prepared, and the secretary was instructed to send a copy of it to the committee.

Revision of Institution By-laws.—This matter is under the consideration of the General Purposes Committee, who will present their report in due course.

Architects' Registration Bill.—A communication was read from the Society of Architects stating that no further action would be taken as regards this Bill during the present crisis, and that the proposed conference between the society and the institution must therefore be held over.

Council Meetings.—It was decided that London

council meetings should be held on the last Wednesday in the month at 5.30. The next meeting will therefore be held on April 28th.

B. Wyand.
Secretary.

39 Victoria-street, S.W.

NORTH-EASTERN AND EASTERN DISTRICTS.

A meeting of the North-Eastern and Eastern Districts of the institution will be held at Newark-on-Trent on Saturday, April 24th.

1.45 p.m.—Meet at the Saracen's Head Hotel, and proceed to the inspection of old castle ruins. En route Ossington Coffee Palace, Trent Bridge and free library will be pointed out.

Parish church (exterior and interior). A short organ recital will be given by Mr. W. F. Wright, A.R.C.O., organist.

Old Magnus Buildings, with Tudor Hall, recently restored at a cost of £2,000 by Mr. H. W. Lockton, M.S.A. (member).

Various old buildings in Market-place.

Beaumond Cross.

New Magnus Grammar School (by the kindness of the Rev. H. Gorse, M.A., head master), designed by Mr. Lockton, and carried out at a cost of over £10,000.

5 p.m.—High tea at the Saracen's Head Hotel, at a cost of 2s. 6d. per head.

Short descriptive notes of the visits will be given by Mr. Lockton, and by Mr. P. A. Watford (member), surveyor, Claypole Rural District Council.

Members of the Yorkshire and other districts are invited to attend.

G. Belson Chilvers.
Hon. District Secretary.

Oundle, Northants.

SOUTHERN AND SOUTH-EASTERN DISTRICTS.

A visit will be paid on Saturday, April 24th, to the New County Hall Works of the London County Council.

Members will meet on the site of the works, Belvedere-road, Westminster Bridge, at 2.30.

The contract now in progress embraces roughly some three-fourths of the complete building (the northern blocks being not yet commenced), and the bulk of the work is at about second floor level.

Members contemplating attendance are requested to send me a card.

Arthur Palmer.
Hon. District Secretary.

Town Hall,
Greenwich.

SOCIETY OF ENGINEERS.

At a meeting of the Society of Engineers to be held on Tuesday next at the Institution of Electrical Engineers, Victoria Embankment, W.C., a paper, entitled "Main Roads, Past and Present, and Modern Methods of Construction and Maintenance," will be read by Mr. Frank Grove, M.I.M. and Co.E., assistant county surveyor of Surrey, the following being a synopsis:—

Brief history of roads from the time of the Romans to the present day—Traffic requirements immediately prior to the introduction of self-propelled vehicles—Details of road construction at that time—Effects of motor traffic on the old type of roads, and some methods employed to cope therewith—Description of a few of the modern methods of road construction and maintenance employed during recent years in the county of Surrey.

The chair will be taken at 7.30 p.m.

S. E. Redman,
Secretary.

17 Victoria-street, S.W.

An Expert Wanted.—Mr. William H. Eley, engineer and surveyor, Town Hall, Newmarket, writes: "My council are anxious to appoint an expert to test the illuminating power of the street lamps, as provided by the contract between the council and the gas company. I am anxious to obtain from other councils the names and addresses of their expert in this matter so that I may submit them to my council. Perhaps the publicity of your columns would enable me to obtain the desired information."

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

CLERK OF WORKS.—April 10th.—Llandaff and Dinas Powis Rural District Council. £2 2s. per week.—Mr. J. Holden, surveyor, 20 Park-place, Cardiff.

SURVEYOR.—April 10th.—Horncastle Rural District Council. £2 per week.—Mr. J. E. Chatterton, clerk.

ROAD FOREMAN.—April 13th.—Chesham Urban District Council. 32s. 6d. per week.—Mr. Percy C. Dorman, engineer and surveyor, Council Offices, Chesham, Bucks.

ASSISTANT SURVEYOR.—April 16th.—Wellingborough Urban District Council. £120 per annum.—Mr. J. T. Parker, clerk, 29 Church-street, Wellingborough.

ASSISTANT IN BOROUGH SURVEYOR'S OFFICE.—April 17th.—Corporation of Dorchester.—Mr. H. D. Strange, borough surveyor, North-square, Dorchester.

MUNICIPAL COMPETITIONS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

WHITEHAVEN.—April 21st.—Competitive designs for laying out the coach road site (6 acres 1 rood 25 poles) and the erection of houses, for the town council. Premiums, 30, 20 and 10 guineas.—Mr. T. Brown, town clerk.

GALEMIRE.—Designs for a small hospital, for the Galemire (Whitehaven) Joint Hospital Committee.—Mr. E. B. Croasdell, clerk, Union Hall, Whitehaven.

STEPNEY.—Designs for municipal buildings, for the borough council. Mr. H. T. Hare, F.R.I.B.A., has been appointed assessor.—Mr. G. W. Clarke, town clerk, 15 Great Alie-street, Whitechapel.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

STREET.—April 12th.—For [illegible] station and works, for the urban district council.—Mr. W. H. Cousins, surveyor, Council Offices, Street, Somerset.

TYRONE.—April 12th.—For additions to Dungannon [illegible] and [illegible] the county council.—Mr. [illegible] Dungannon.

EASINGTON.—April 13th.—For the erection of fifty houses, and the construction of streets, for the rural district council.—Mr. G. Waterhouse, [illegible] Council Offices.

GLAMORGAN.—April 14th.—For the [illegible] bridge, for the county council.—County Hall, Cardiff.

BRADFORD.—April 15th.—For excavating trench and laying water pipes, for the corporation.—Mr. J. Watson, waterworks engineer, Town Hall.

ARRINGTON.—April 15th.—For the erection of three pairs of cottages, for the rural district council.—Mr. S. G. Wilkinson, clerk, St. Neots.

ASHINGTON.—April 17th.—For the erection of gasworks, for the urban district council.—Messrs. W. A. Valon & Son, Caxton House, Westminster, S.W.

HALIFAX.—April 17th.—For the erection of a tramway waiting-room and tool-house, for the corporation.—Mr. J. Lord, borough engineer and surveyor.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Rural Housing.

At a meeting of the Surveyors Institution held on March last the paper on the housing question was read, its recommendations being based on the report of the Land Enquiry Committee. The first of these papers was by Mr. E. Strachan Gardiner, and dealt with Rural Housing. It will be remembered that the committee recommended a substantial increase in such an increase in the wages of the rural labourer as would enable him to pay an economic rent. This increase is to be secured by the establishment by law of a minimum wage. The economic and political considerations involved in this proposal do not enter into the present question, and we shall therefore confine our remarks to certain general factors which go to show that some effective action must be taken by the Government as soon as possible after the passing of the present crisis. And first, as Mr. Gardiner pointed out, the general standard of living is rising steadily, and an element that is going to have its effect on the housing question is the influence of the great improvement in elementary education upon the children of the rising generation, who will not be content with the conditions which have satisfied their parents. It is generally admitted that as a result of their investigations the committee were able to make out a strong case for the immediate necessity of erecting a large additional number of rural cottages. Moreover, many existing cottages are in a very unsatisfactory condition, and their owners are not in a position to bear the cost of repair or reinstatement. Local authorities are thus not infrequently placed in a dilemma. If such cottages are closed under the Housing Acts, the displaced families are unable to find other accommodation, while the only alternative is to wink at the continued occupation of dwellings that are admittedly insanitary. In such cases Mr. Gardiner suggests that small owners might be assisted to put their houses in order by an extension of the Manchester Corporation practice, under which the work is carried out by the local authority, the owner repaying the amount expended by instalments with interest.

The report of the committee emphasises the necessity of stimulating local authorities to make more extended use of their powers under the Housing Acts. It appears, however, from the report of the Local Government Board on Housing and Town Planning in 1913-14 that something in the nature of a boom in house building by local [illegible] we find that in the last year for which statistics are available the number of local authorities who obtained sanctions to loans, the number of local authorities who obtained sanctions for the first time, and the amounts sanctioned all exceeded by about 100 per cent the numbers and amounts in any previous year since the passing of the Act of 1890. A good deal of this building, however, has taken place in urban areas, and the annual reports of the medical officers of health show that the conditions in many rural districts are still deplorable. The reason for this is to be found in the impossibility of carrying out a self-supporting scheme under existing conditions. If the wage of the labourer could be increased so as to enable him to pay an economic rent this difficulty would [illegible] present deficiency in cottage accommodation would speedily be made good. Mr. Gardiner further points out that as much accommodation as practicable should be provided, for if it is sufficient to enable a family to live together as long as possible they may be able to provide an economic rent from the combined income of the working members, where the earnings of the principal bread-winner would be inadequate to do so.

* * *

Urban Housing.

At the same meeting a very instructive paper on "Urban Housing" was read by Mr. C. S. Joseph. Mr. Joseph expressed general agreement with the conclusions of the Land Enquiry Committee as to the serious nature of the existing evils which have to be combated if the poorer classes of town dwellers are to be properly housed. In the first place there can be no doubt that a large proportion of the urban population of the country occupy overcrowded and insanitary dwellings owing to the scarcity of suitable accommodation at a reasonable rent. In the county of London alone over 250,000 persons live in one-room tenements, the number of such tenements occupied by more than two persons being considerably more than 30,000. From this it will be seen that the supply of dwellings, whether by public authorities, public utility societies, or private enterprise, is very much less than the demand, a fact which may be attributed to the high cost of land, especially in central areas, the incidence of rates, and the provisions of local by-laws. The precise effect of each of these three factors on the rent to be charged is matter for

debate. It is worthy of remark, however, that Mr. Joseph, who has a very large experience of the erection of block dwellings, expressed the opinion that the cost of land has not so important a bearing on the problem as is indicated in the report, and that it is quite feasible to pay 7s. 6d. per foot for a site upon which dwellings may be erected and yet obtain a fair return on the capital outlay. At this price the cost of land represents 1s. 1d. per week per tenement. The question of the rates is one to which sufficient importance is not always attached, particularly in view of the fact that the need for a large provision of good accommodation, letting at a low rent, is greatest in the poorer and overcrowded districts, which are, without exception, those which are burdened with the greatest need for public expenditure, resulting in the highest rate in the £. Moreover, there is a general tendency for rates to rise, so that they form a fluctuating charge, and as they cannot be met by an adjustment of capital, any increases must necessarily be directly reflected in higher rents, without regard to the ability of the tenants to pay.

Mr. Joseph summarised the remedies suggested in the report under four main heads. First, that as a result of a complete survey of their district a local authority shall prepare a scheme for the provision of the necessary housing accommodation, particularly for the population likely to be permanently resident within their area. And here we agree with Mr. Joseph that it is not in the lack of powers, but in the neglect to exercise them that the chief difficulty lies. He points out that a good deal of the hesitation on the part of local authorities to embark upon housing schemes is due to the fear that there may be a charge upon the rates; but profitable schemes have been carried out in London in the past, and might be even now if advantage be taken of the borrowing powers under the Housing of the Working Classes Act, 1914. The other remedies were concerned with transit to outlying districts, financial assistance to public utility societies, and the improvement of insanitary property. The last named is not in reality a remedy at all, but rather a temporary expedient which has the great disadvantage of increasing the life of really unsuitable houses, instead of utilising the land on which they stand to the best advantage.

* * *

Dry Closets: The Royal Commission's Recommendations.

Theoretical considerations may warrant the use of the earth-closet and the ashpit privy, but it is surely time that the many shortcomings of the system, advocated in the concluding pages of the Ninth Report of the Royal Commission on Sewage Disposal, were generally acknowledged. Those who have had many years of practical experience in the inspection of such appliances know only too well from the disgusting nature of their task how utterly inferior to the water-closet are such contrivances in practical working, and how absolutely certain it is that the earth-closet, even under the best conditions, will be neglected at times. In the poorer dwellings the case is bad enough owing to the difficulty of obtaining dry earth, to the need for continuous, unremitting care, and to many other causes. In the larger houses there may be one or two earth-closets which are kept in proper order, but in the servants' quarters or in the stables it will generally be found that the condition of affairs is horrible. Further, the chances of the spread of typhoid, in the event of the presence of a typhoid carrier, are not inconsiderable, particularly on dark, wet mornings when the process of emptying the buckets and digging the contents into the ground is apt to be hurried, and clothes and hands are practically certain to become contaminated. Such work may be done, say, by a cowman, who forthwith proceeds to milk cows. The process is not only objectionable, but it is generally accompanied by great nuisance and danger. Then again the futility of the process ought to be obvious. Of what use is it to dispose of the fæcal matter in this way if all the slop water, including urine, remains to be treated? Such water contains not only urine, but the foul waters from the kitchens, with fat and vegetable and animal refuse, the washings of dirty clothes and of the people themselves, the dirty water from floor washings, and many other foul matters. These constitute sewage, and cause trouble and pollution, and, futhermore, the addition of fæcal matter to such water renders it easier of treatment. Where a group of houses, or even a single house exists, some sort of treatment, which may often be extremely simple, is necessary.

Dealt with by a competent engineer, the matter is not one of great difficulty, even with a limited water supply, and the Royal Commission might have found many instances of such successful treatment. It is therefore a matter of surprise and regret to find that they state that where the water supply is inadequate "a system of dry closets may be open to little objection," and that "in small communities the removal of the contents may generally be left to the householder," while "in larger villages it may with advantage be undertaken by the local authority." The privy midden, we are told, "may be much improved," and its use is apparently approved if ashes are "applied to the excretion in order to mitigate the offensiveness." It is almost impossible to believe that the suggestion of a large village, in which each house is provided with a privy midden or ashpit, or with an earth-closet, is approved by the Royal Commission. The idea seems to be entirely retrograde, and it is to be doubted if the engineers of the Local Government Board will ever approve such a recommendation in actual practice. It would be of general interest if those of our readers whose experience extends to the extensive use of earth-closets or of privy ashpits would contribute their opinions on this very important matter.

* * *

The Roads Improvement Association.

Among the various functions of the Roads Improvement Association, not the least important is that of acting as a means of communication between road users and those authorities and engineers who are responsible for the maintenance of the highways. It is satisfactory therefore to find that a prominent place is given in the recently published annual report for 1914-15 to the two conferences with surveyors which were held during the year. It will be remembered that the first of these gatherings took place at the Royal Automobile Club, when Sir George Gibb was the guest of the evening, and that at the second, which was held at Leicester, Mr. H. Percy Boulnois, M.Inst.C.E., opened a discussion on "Modern Road Methods." Both conferences were very successful, and it is intended in more normal times to hold others with a view to provide further opportunities of collaboration between road users and highway engineers. The report deals with many other matters of interest, and although the activities of the association have been necessarily somewhat restricted since the outbreak of war, the year under review has witnessed the accomplishment of much useful work. For example, the proposal contained in the Great West Road Bill, promoted by the Middlesex County Council, that motor omnibuses should make a direct payment for the use of the new road, was strenuously opposed in the House of Lords, and although the opposition

was not successful, it was the means of placing before Parliament the views of the association upon a question of principle as to which there has been much difference of opinion. Another matter upon which the association is deserving of congratulation is the announcement by the Chancellor of the Exchequer last year of the adoption by the Government of the principle of state grants in aid of the expenses of maintenance of main and county roads, in accordance with the recommendations contained in the final report of the Departmental Committee on Local Taxation. The Roads Improvement Association has been persistent in its advocacy of such a policy, and the new departure indicated by the Chancellor of the Exchequer marks the successful issue of the campaign.

Before leaving the subject, reference must be made to the Horse Shoe Competition organised by the association in conjunction with the Royal Society for the Prevention of Cruelty to Animals. In writing of this competition some time ago we pointed out that the success of a bituminous road surface depends largely upon its power to resist the penetration of water, and in order that this power may be retained it is important that the surface shall remain smooth and unbroken. Smooth surfaces, however, are not suited to the ordinary types of horse shoe, and lead to the use of calkins or other projections which damage the roads and render them no longer waterproof. Hence the competition, the results of which, however, were on the whole disappointing, inasmuch as no shoe or device entered was of sufficient merit to warrant the award of the first prize of £100. Moreover, neither of the first two of the smaller premiums awarded was based upon any new idea, the appliance in each case consisting of an improved method of adapting an old device. In addition to the general work of the association many local improvements, an interesting summary of which is included in the report, have been effected as a result of the efforts of the several branches.

* * *

The Nottingham Slum Clearances.

Nottingham Corporation have this week decided to proceed with the fulfilment of the Carter-gate and Manvers-street improvement scheme, concerning the desirability of which there has been more than ample discussion. This, one of the final stages of the matter, was not allowed to pass without a protest from a minority of members who, no doubt from the most conscientious motives, sought to prove that the site of the scheme was ill chosen, that it was needlessly costly, and that a great deal of expense would have to be incurred under the compulsory conditions of rehousing that are imposed upon the town council by the Local Government Board. This is the kind of opposition with which we are familiarised by people who, perhaps unconsciously, or because pecuniary interests are involved, are disposed to exaggerate the rights of proprietorship, and at the same time to overlook, or at all events under-estimate, the larger issues of public health and municipal progress. To seek to magnify the mere material and monetary aspects of the subject is to pay a poor compliment to the ideals underlying our housing legislation, or to professional men, architects, municipal surveyors, and sanitary engineers in their efforts to give practical effect to these ideals. Fortunately, the principal local paper of Nottingham, the *Guardian*, leaves no room for doubt as to the side it takes with respect to this particular phase of the matter. Writing on the decision of the town council, it says: "There is room for difference of opinion as to the type of house that is needed, and on this point the opinion of Councillor Goddard, who is opposed to the plans of the Housing Committee, ought to carry weight. But in reference to the need for clearing such areas as Carter-gate there need be no further discussion. The conscience of the nation demands that men and women and children shall not be housed in places not fit for dog-kennels, and the owners of such houses, instead of whining about their losses, may be thankful that [illegible] ."

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Fire Tests with Automatic Sprinklers.

The British Fire Prevention Committee have issued as Report No. 199 a record of a series of tests with an automatic sprinkler submitted by a Philadelphia firm of manufacturers. The series of tests, which were far more elaborate than usual, dealt with the sensitiveness of the sprinkler heads, their reliability, distribution, flow of water, strength and durability, the scientific tests being supplemented by actual fire tests to show the range of efficiency. The British Fire Prevention Committee has not been testing sprinkler heads for some ten years, and the methods adopted are an improvement upon their earlier form, one of the advantages being that there is now made available a considerable amount of technical detail that was previously only known to a limited few.

It may be anticipated that, while the series of tests reported upon deals with one specific American appliance, the committee may, on the termination of the war, undertake a similar series with all the sprinklers at present on the market, and this would be a material advantage to the technical as also to the insurance profession, and lift the veil of a certain amount of secretiveness regarding relative utility and limitations of the various rules of this very useful class of automatic fire appliance. One of the most interesting features of the report is a novel form of comparing the amount of water distributed by the actual sprinklers under test with what should have been distributed if the action of the sprinkler head could be made ideally regular.

* * *

Municipal Employees and the War.

In the *Birmingham Daily Post* for Saturday last there appeared a statement by the Lord Mayor respecting the arrangements which have been made for the release of corporation workmen for service in armament factories. From this it appears that a representative of the Local Government Board had waited upon the Lord Mayor to urge the desirability of the corporation releasing as many of their workmen as possible for employment by the Government in the manufacture of munitions and other materials required for the prosecution of the war. As a result, it has been found possible to release no fewer than 1,062 men for such service, and although this necessarily involves a good deal of inconvenience, it is anticipated that the citizens will give their loyal approval to the action that has been taken. We understand that a similar visit has been made to the offices of the Surbiton Urban District Council, where a complete list of workmen was submitted, together with their ages and the class of work on which they are engaged. From this list a certain number were selected, and it was understood that they would shortly receive communications from the War Office with a view to their being drafted, with their consent, to some work in connection with the manufacture of munitions of war. Both at Birmingham and Surbiton the positions of the men drafted into Government service are to be kept open. There can be little doubt that other local authorities will be similarly approached in the very near future.

A Cape Town Bathing Pavilion.

By A. N. HENDERSON, assoc.m.inst.c.e.

Pleasantly situated on the outskirts of Cape Town, Sea Point, besides being a favourite residential suburb, is deservedly popular as a holiday resort for visitors from all parts of the Union of South Africa, and even from Europe. One of the chief recreations of residents and visitors alike, during the warm summer months is bathing, the southerly Antarctic current rendering the sea beautifully cool and refreshing even on the hottest day. As the coast-line is, to a large extent, rocky, and subject to the very heavy rollers from the open sea, it has been necessary to construct artificial pools to allow of bathing being indulged in in safety. Several of these are dotted along the foreshore, but it became obvious that, owing to the increased influx of visitors, something on a larger scale would have to be erected if Sea Point was to retain its popularity.

The Municipality of Green and Sea Point, now merged in the Municipality of Greater Cape Town, therefore decided in 1912 to construct a pool and a pavilion which would serve the needs of the district for some time to come. After careful consideration the conclusion was come to that reinforced concrete on the Kahn system was the most suitable material of which to construct the pavilion, and the following is a brief description of the work now completed.

The building was erected in conjunction with a large swimming pool, 250 ft. by 180 ft. by 6 ft. maximum depth, formed out of the rocky foreshore, with a heavy mass concrete sea-wall to seaward. It consists of a ground floor, slightly below road level, on which are situated 130 cubicles for male bathers and 120 for female bathers, shower and slipper baths, lavatories, attendants' rooms, and two large club-rooms. A balcony 8 ft. wide extends along the entire sea-face of the building at ground floor level. The shore below ground floor and balcony is covered several feet deep with sand, and forms an extensive shelter from the sun, and a children's playground. Above the ground floor is a promenade-roof with two shelters, one of which is used as a bandstand, and over the centre part of which a large refreshment room has been constructed. There are semi-circular balconettes at intervals on the roof, cantilevered out over the balcony below. In plan the building is "U" shaped, with an overall length of about 250 ft., and two wings 71 ft. long; the width throughout is 33 ft.

The main columns are spaced at about 16 ft. centres transversely, and longitudinally the centres vary from 21 ft. 6 in. downwards. They are 16 in. square throughout, which gives an ample allowance in the case of another story being added. The balcony columns are 10 in. square, and all columns were taken down to rock. At the sea end of the wings, where they are most subject to wave action, the columns are braced. There is a retaining wall below the ground floor and down to rock along the land side of the building. It is 11 ft. 6 in. high by 7 in. thick, and of vertical slab design.

Bathing Pavilion and Swimming Pool, Sea Point, Cape Town.

The longitudinal main beams are 18 in. deep below the floor, by 10 in. wide, and the secondary transverse beams are all 12 in. deep by 7 in. wide at about 6-ft. centres.

Two contraction joints were formed in the length of the building, thus dividing it up into three portions; but although these seem to act quite satisfactorily, the very trying conditions experienced in this part of the world appear to require more allowance for contraction, as cracks have not been entirely obviated.

The promenade portion of the roof has been covered with asphalt. The walls are of reinforced concrete throughout, 4 in. thick. They were rubbed down with a hardwood rubber on the removal of the centering, but otherwise are as the shuttering left them. All mouldings were formed in the shuttering. Copings and parapet, except where the latter was of open construction, were formed in situ.

There are two reinforced concrete stairways from ground floor to promenade. A reinforced concrete footbridge has been constructed over the railway line in front of the pavilion to serve as the main approach. The bridge was originally constructed as a single span of 20 ft. clear, with stairs at either

end. It was subsequently decided to add another span of 25 ft., so that vessels could be cleared close to the promenade pier. At each end of the 25-ft. span there are short cantilevered projections, and the main slab has been cantilevered out on each

The accompanying illustrations show what an attraction the new pavilion offers to visitors at Sea Point.

[The foregoing article should be read in conjunction with the notice of the May number of *Reinforced Engineering*, and in

A Close View of Sea Point Bathing Pavilion.

ade to support partitions between the [illegible] have been inserted.

The aggregate was got from the site and crushed by machine. The sand on the site was also used and the concrete was mixed in a Ransome batch mixer. The scantling was composed of specially heavy, tongued and grooved boarding, and was made use of only a limited number of times. A great deal of it was finally used for [illegible] purposes.

The work was commenced in January, 1913, and completed with the exception of the dredging in February, 1914. The total cost, including the pavil[illegible]

prietors of that journal. -Ed. Surveyor.]

Society of Engineers' Lectures.—In continuance of the [illegible] before student engineering societies affiliated to the Society of Engineers, Mr. Henry C. Adams, M.Inst.C.E., M.I.Mech.E., vice-president of that body, lectured on Steel Structures Simplified to the members of the Crystal Palace Engineering Society on March 17th. The chair was taken by the principal of the Crystal Palace School of Engineering, Mr. J. W. Wilson, [illegible] past-president of the Society.

Reinforced Concrete Footbridge, Sea Point

This serves as the main approach to the Bathing Pavilion.

was £16,000. The architect was Mr. Fred Cherry, the engineer Mr. Nisbet Roberts, and the contractors were Messrs. Murray & Stewart. The engineers for the reinforced concrete were the Trussed Concrete Steel Company, Limited, the Kahn system being used throughout.

of Engineers, who was supported by the vice-principal, Mr. Maurice Wilson, Assoc.M.Inst.C.E., past-president of the Society of Engineers. On behalf of the students the chairman expressed their thanks to Mr. Adams for his lecture, and to the council of the Society of Engineers for having initiated the scheme.

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Main Roads Past and Present, and Modern Methods of Construction and Maintenance.*

By FRANK GROVE, M.Inst.M. and C.E., Assistant County Surveyor of Surrey.

The difficulties of satisfactory road construction and maintenance in this country have in recent years reached a very acute stage, which has been brought home with much force to all road engineers and others interested in the work, and in a particularly unpleasant form to the ratepayer who has been called upon to meet the increased cost, the extent of which has caused him no little alarm. This paper gives an outline of the inception and development of the road system in this country, and indicates in detail some modern attempts to cope with traffic ever increasing in weight and numbers.

History of Roads in England from Roman Times.

We are told by various writers that the Romans, the greatest road makers of ancient times, were noted for the excellence of their roads, which were laid out in straight lines from point to point, often regardless of obstacles which might have been avoided, and have never been excelled in solidity of construction. Their general straightness may perhaps have been due to convenience in setting out or to their being laid out in a line with some prominent landmark. Some of them still remain, forming the foundation of more modern roads. Their general method of construction consisted of a foundation of one or several courses of flat stones laid in mortar, with a surface of pavement blocks laid on concrete and jointed with mortar, and were often 3 ft. or more in thickness. For the small amount of traffic they had to carry their construction would seem to have been unnecessarily substantial. The usual width of the paved portion of the road was about 14 ft., with unpaved ways on both sides about half the width of the paved road, and separated from it by raised stone edgings. The surface was sometimes made of hard concrete, pebbles, or flints set in mortar, and sometimes in clay and marl. Where inferior materials were used the surface of the road was made higher and rounder in cross-section.

The Roman roads remained in use down to the Middle Ages, but no regular provision was made for their maintenance, and they gradually fell into disuse. The materials used for their construction were pillaged for building material, and they were in parts ploughed up so that they are now mostly unidentifiable. Although there are no traces of Roman influence in the later roads in England, which are generally more or less tortuous, their straightness appears to have been copied to some extent in France about the beginning of the eighteenth century, when new roads, known as "Routes Nationales" and "Routes Départementales," were constructed by the Government of that country.

During the Middle Ages there was practically no vehicular traffic, and comparatively few new roads were constructed. Those that were made fell far short of the Roman standard, and for the most part cannot now be traced. They were practically dependent upon charitable bequests for their repair, and these bequests, although usual upon specified roads, were sometimes made for the repair of unspecified roads, and generally took the form of gravel or other material for repairs. Guilds largely contributed to the maintenance of the roads, and monasteries and the clergy also assisted.

Many ways were constructed during the Saxon and Norman periods, the most interesting of which were those by which pilgrims travelled to the various shrines throughout the country, traces of which still remain. In Tudor and Stuart times highways, holloways, causeways, and other ways were made, and took their names from their method of construction, which was very primitive, while they were narrow, and, as a whole, badly kept.

In the fourteenth century vehicular traffic was not unknown, but it did not become general until the middle of the sixteenth century, when public road vehicles were first introduced. The roads at that time, however, were most unsuitable for such traffic. Before the end of the sixteenth century coaches became the general means of conveyance among the wealthy classes, and stage coaches appear to have been introduced towards the middle of the seventeenth century. At first there was a great outcry against their introduction, and it was some time before the old method of personal conveyance by saddle-horse became obsolete, and stage wagons were substituted for pack-horses.

At the beginning of the seventeenth century, owing to the increased use of vehicles, the Legislature had to choose between adapting the roads to wheeled traffic or adapting wheeled traffic to the roads. It chose the latter course, with the result that numberless Acts of Parliament were passed restricting the number of horses to be used in carts and wagons, the weights to be carried, and the widths of wheels. The greater the width of tyre the less toll had to be paid, the theory being that broad wheels tended to preserve and consolidate the roads, whereas narrow ones cut them up, thereby increasing the cost of their upkeep. Each parish had to maintain its own roads by statute labour, and this no doubt accounted largely for their bad condition. The road problem was eventually solved by adapting the roads to the traffic by the passing of the Highway Act of 1835 (referred to later), which at one sweep removed most of the restrictions on traffic.

Down to the middle of the eighteenth century the roads then existing were hardly worthy of the name, and were for the most part hilly and tortuous tracks, because low-lying ground was never crossed if it could be avoided. Local taxation was the sole method of raising money for absolutely necessary repairs, and no doubt the standard was a low one. The establishment by law of numerous turnpike trusts, peculiar to this country, enabled gates or barriers to be set up, and tolls levied upon the persons using the roads, the money thus obtained being utilised in their maintenance and improvement. The system was cumbrous, and the persons appointed to administer the tolls so incompetent, that very little improvement was effected. The turnpike trusts added largely to the number of hilly roads, and no attempt was made to obtain expert advice or skilled labour in the execution of the necessary repairs. Such materials as could be most readily obtained were heaped upon the middle of the roads without any attempt being made to consolidate them. The roads thus became so convex that the only safe place for the traffic was along the centre of the road, and the wheels of vehicles pressing against the sides of the roads caused deep ruts, and pushed the materials into the ditches.

This state of affairs existed until the beginning of the nineteenth century, when Telford and Macadam directed their attention to the construction of roads and brought scientific principles and regular system to bear upon their construction and repair. Their methods were very similar, including thorough drainage, the use of properly broken stone, and the adoption of a uniform cross-section of moderate curvature. Angular broken stone was spread evenly over the surface and finer material sprinkled thereon, so that the traffic passing over the road would consolidate the material and form a hard, smooth surface. Telford paid particular attention to the foundation, and his name is associated with a pitched foundation, which he did not always use, and which closely resembled that which had long been in use in France. Macadam, however, disregarded it, contending that the subsoil, however bad, would carry any weight if made dry by drainage, and kept dry by an impervious covering. Macadam was chiefly engaged on the repair of old roads, and the improvement which he effected in road management and maintenance was great and lasting. His method of repairing roads became general, and with the addition of the use of a roller to consolidate the material is still chiefly employed on the majority of roads in this country to-day. The process of rolling the newly laid material appears to have been adopted about the year 1830, but it was some years later before the practice became general, chiefly because of the expense entailed. The steam roller made its appearance about the year 1863, and in the first instance was an adaptation of a form of traction engine.

In 1835 an Act of Parliament was passed to consolidate and amend the laws relating to highways in England. This placed the burden of upkeep of the

* Paper read at a Meeting of the Society of Engineers on Tuesday.

roads on each parish and gave Justices of Quarter Sessions power to unite parishes into districts. This Act related to the appointment of surveyors of highways and boards of management, and authorised the erection of guide stones and posts at cross-roads and other places. The surveyor was empowered to make, assess and levy a rate in order to carry out the purposes of the Act. Much of this Act is still in force, and forms the basis of highway law in many respects at the present day.

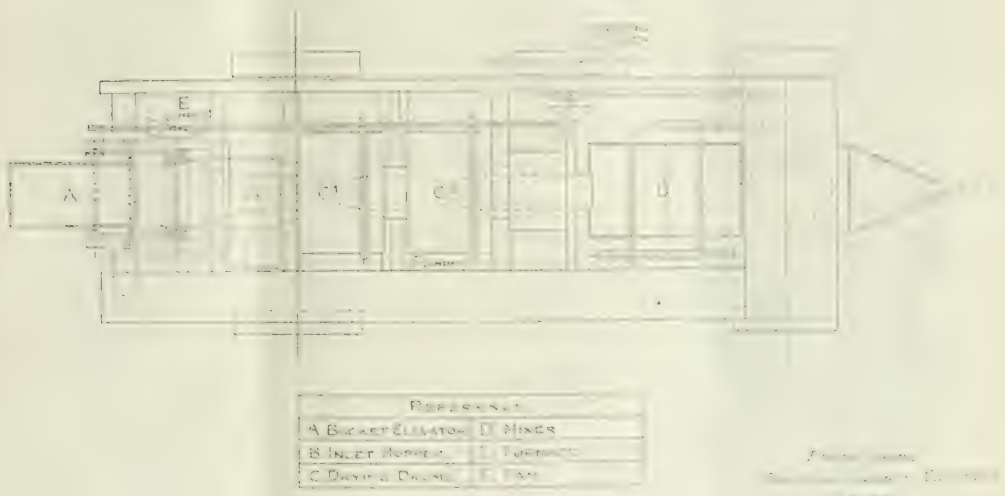
With the great development of railways in the Victorian era the traffic temporarily left the roads, and this resulted in their neglect, although strenuous efforts appear to have been made during the last days of coaching to improve the roads in order to keep the traffic upon them. The turnpike trusts had by this time become heavily in debt owing to a large decrease in tolls, but in spite of this they struggled on for a considerable period, and it was not until the Highways and Locomotives (Amendment) Act of 1878 was passed that their fate was eventually sealed. This Act gave the county authority power to enforce the repair of roads, and stipulated that all roads disturnpiked after 1870 should become main roads, half the expense of maintenance being thrown upon the county rate. This Act also empowered the county

tary scavenging necessary for the convenience of the inhabitants.

TRAFFIC [illegible] IMMEDIATELY PRIOR TO THE INTRODUCTION OF MOTOR VEHICLES AND DETAILS OF ROAD CONSTRUCTION AT THAT TIME

Towards the end of the nineteenth century, and just prior to the introduction of the self-propelled vehicle, a general improvement of the main roads had been effected. This was no doubt in a great measure due to the general improvement of the means of transport, both as regards passengers and merchandise, and also to the increased popularity of cycling, which had then reached its zenith. The spreading of the cost of maintenance over a larger area, and the more skilled supervision provided by the county councils, also tended to a more uniform and better standard of maintenance. The surface of the Surrey roads consisted mainly of local gravel, flint and other local stone, of which there was an abundant supply within the borders of the county, but the majority of the roads were sadly lacking in good foundations. The latter was mainly an aggregation of gravel and other local materials used from time to time in the various coatings and laid upon the natural subsoil. The traffic, however, on some

SKETCH PLAN OF [illegible] ARRANGEMENT OF DRYING AND MIXING PLANT
¾" SCALE



authority to declare ordinary highways to be main roads.

Since April 1, 1889, the appointed day referred to in the Local Government Act of 1888, main roads have, in general, been wholly maintained and repaired by the county council. Urban authorities, however, were offered the option of "claiming" to retain the control of the main roads in their districts, the county council making an annual payment in respect thereof. This Act also enabled the county council, if so disposed, to delegate the control of the main roads in "unclaimed" districts to local highway authorities, making an annual payment out of the county rate towards the maintenance, repair, and reasonable improvement of same. Some county councils adopt the system of direct management for the main roads while others adhere to maintenance through the local authorities, and opinions differ as to which is the better method. In the county of Surrey, where the author's experience covers a period of nineteen years, a dual system is in existence, although only a small mileage is directly maintained. This is no doubt very largely because the county bordering on the Metropolis consists for the most part of urban districts where direct management would be difficult, inasmuch as the county council is liable only for such scavenging as is necessary for maintenance, while the local authority is responsible for any sani-

of the more important trunk roads had grown to such an enormous extent that it had become necessary to substitute a tougher material for the flint and local stone formerly used. This necessitated the use of various kinds of granite, basalt, limestone, &c., all of which had to be imported into the county from the Midland and Western Counties and from abroad, and consequently added very considerably to the cost of upkeep.

The principle of repairing the roads at that time was entirely that of the water-bound macadam method. The surface of the portion of road to be repaired was first loosened either by means of hand-picking or of a scarifier attached to a steam roller. The loosened material was then carefully raked until a regular camber with a fall of 1 in. in 2 ft. from the centre to both sides was obtained. In low-lying and damp places a little more fall was given, and in dry open places and on hills a little less. Any depressions or soft places were made up with new metal, usually large unbroken flints. The new material, carefully broken to a gauge of about 2 in., was then, under the superintendence of a competent spreader, evenly spread over the whole width of the carriageway to a depth of about 3 in. or more and rolled dry without crushing the material, after which binding material, such as clean sand, fine gravel, hoggin, or sometimes road sweepings, was sprinkled

thinly upon the partially rolled surface. Water was then applied and the surface again rolled. Labourers were then employed to sweep the surface until the resultant slurry completely filled all the interstices between the stones and the new metal became thoroughly consolidated. The usual weight of the roller used was about 10 tons. It was found that the surface of a flint road, if properly attended to, continued to improve under traffic for some time after the metalling had been applied, whereas the surface of a granite road quickly became uneven and steadily deteriorated from the day the steam roller left it. To obtain a more even surface, granite of a smaller gauge than 2 in. was tried, but this smaller gauge was used only after a sufficient crust had been formed by the use of granite of a larger gauge. The autumn or the early winter months was considered the best time of the year to carry out the repairs, as depressions and soft places could be more readily detected when the roads were in a wet state, besides which the surface could be more easily scored and the new material more readily worked into the old. The materials for the annual repairs, which were, as far as possible, obtained, carted, and, in the case of flints, broken during the summer months when the roads were hard, were deposited in depots by the side of the road nearest to the point where the material was to be applied. Wherever possible the repairs were executed in long lengths in preference to patching, which is never a very satisfactory method of repairing roads.

The roads were divided into lengths of from 2 to 5 miles, and permanent roadmen, called "lengthmen," were employed throughout the year to scrape and sweep the surface, and the road sweepings, after being collected at the sides, were removed as soon as possible, or distributed over the roadside wastes. Small quantities of patching material were stored in depots at convenient intervals, so that in case of hollows and weak places appearing they could be quickly filled up and attended to by the lengthmen before further damage was done. During periods of long drought the surface, more especially in urban districts, was watered to prevent it breaking up and being worn to dust under the constant traffic. Flint roads break up more quickly than granite under continuous and heavy traffic in dry weather, but whereas watering or damp weather improves a flint road, continuous rain or the constant flooding of a granite road by excessive watering does more harm than good. The water collects in the depressions or "potholes," and renders them softer, so that wheeled traffic increases their depth, and if not quickly attended to a very uneven and bumpy surface is the result. Frosts and extraordinary traffic also contribute largely to the break-up, while trenches for sewers, gas, water, and other mains damage the roads extensively, and can almost invariably be traced for a long period, sometimes years, after they have been filled in, however carefully this may be done. During the spring and summer months the lengthmen are employed in keeping the side channels clear of weeds, cleaning out the ditches and grips, trimming verges, breaking flints, &c.

During the period under review very little road construction was carried out owing to the very complete network of highways in existence. Where, however, it became necessary to provide new foundations, the material usually employed was hardcore consisting of old concrete or brick rubble.

The thickness depended upon the nature of the subsoil, 6 in. being considered sufficient on chalk or gravel, increasing to 12 in. on clay and wet soils, with 3 in. of ashes on the bottom to prevent the clay squeezing up into the hardcore during consolidation.

The finishing coat consisted of gravel or flints 6 in. thick, laid and consolidated in two separate thicknesses, the material for the bottom layer being of a larger gauge than the top coat.

Effects of Motor Traffic on the Old Type of Roads, and Methods Employed to Cope Therewith.

Just before the dawn of the present century the lighter form of self-propelled vehicle, which had become legalised by the Motor Car Act of 1896, made its appearance, and although at first the growth of this class of traffic was slow, it was not long before its presence was forcibly felt. Cycling had begun to wane, but this was more than compensated for by the rapid and unparalleled improvement in the transport of passengers and goods, which not only brought about a change in our highway system, but also robbed the railways of a monopoly which they had enjoyed for a number of years. It soon became necessary to permit an increase in the speed of motor cars from 12 to 20 miles an hour, which was done by the passing of the Motor Car Act, 1903. This also gave the Local Government Board power, on the application of the local authority, to reduce the speed to 10 miles an hour on certain specified lengths of highway, and authorised the erection of signposts to denote dangerous corners, cross-roads and precipitous places with a view to the safety of the public.

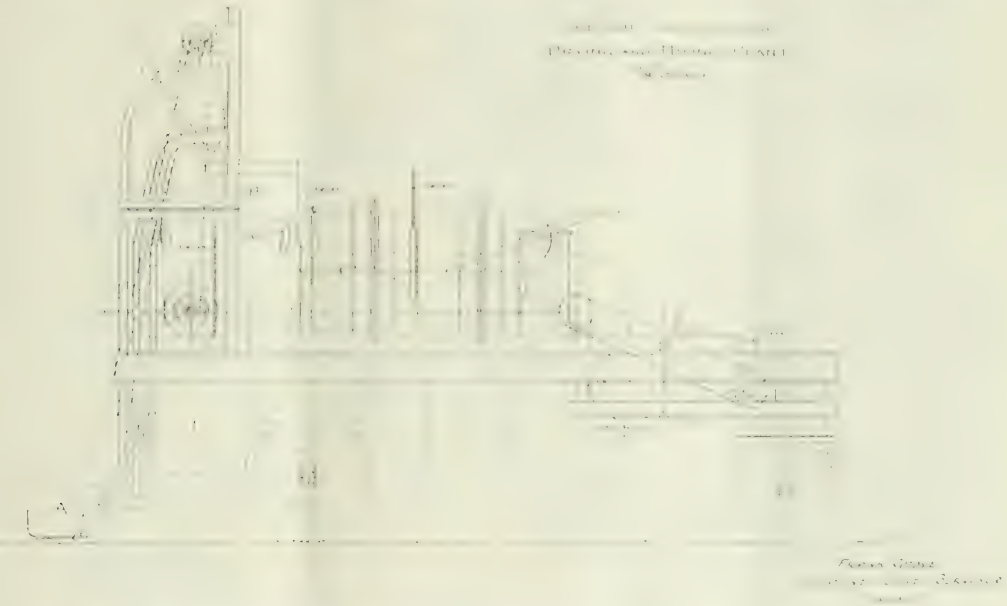
Traction engine and other traffic had also increased very considerably, the use of the former being no doubt greatly extended in consequence of the rates of freightage by railway remaining very high, and as a result of mechanical road traction becoming cheaper than horse traction, a certain amount of which was displaced from the roads. Following in the wake of the automobile for personal conveyance came the light motor vans for the delivery of goods, and also the heavy motor car or lorry with its accompanying trailer attached. These were made legal by the Heavy Motor Car Order of 1904, which arose out of the Act of 1903.

It was not long before the roads as then constructed were found to be entirely unsuitable for this class of traffic. Many long lengths of flint roads where the traffic was heaviest were converted into granite roads, while numerous bridges had also to be strengthened, and in many cases entirely rebuilt, to make them sufficiently strong. The repair of the roads in half widths became a necessity to prevent horsed vehicles carrying heavy weights and motor cars with soft tyres being compelled to pass over lengths of unrolled metal, although the repairs could more easily and efficiently be executed if the whole width were coated from side to side. The rapid growth in the number of motor cars and pleasure vehicles using the roads, especially at week-ends, did considerable damage to the flint roads in consequence of the sucking action of the rubber tyres drawing the small metal to the surface and the ordinary traffic converting it into a layer of sharp fine grit, while at the same time the large metal below became loosened. On macadamised roads small hollows and depressions were also quickly formed. It was no uncommon sight to see a good and apparently sound road after a fine week-end very badly damaged and tracked, rendering constant attention necessary. Motor traffic was also responsible for the numerous complaints received of the nuisance caused by dust and the bad condition of the surface. The dust nuisance became so acute that house property abutting on the principal thoroughfares depreciated to a very appreciable extent—in some instances as much as 20 to 25 per cent—in letting value, while large numbers of houses became empty from the same cause. The enjoyment of the roads by pedestrians, cyclists and others, more especially along lengths of road having no footpath, was greatly interfered with, and ratepayers complained that large sums of money were being spent in maintaining the roads for foreign motor traffic to use and destroy. Traffic statistics taken at the time showed that the main roads in Surrey were more used by motor cars than in any other county around London. In no county had the growth of traffic been more marked or its destructive effects more felt.

The problem of dealing with the dust nuisance and at the same time decreasing the damage done to the surface in order to preserve for the public the use and enjoyment of the highway to which they were entitled was very pressing and difficult, inasmuch as it had become necessary to make the roads strong enough to carry traction engines and heavy motor cars, and at the same time [illegible] for the motor car traffic and owners. It was recognised that, given roads of certain materials and construction, such as granite setts and [illegible] the dust nuisance would disappear, but the cost of such roads was quite beyond the [illegible] ratepayers.

With a view to mitigating or preventing the dust experiments were made with various materials to [illegible] and tars, and in the hope of eventually finding a material the cost of which, spread over a few years, would not greatly increase the cost of maintenance. Limestone and slag of various gauges, dried, heated and mixed with tar or other bituminous mixtures before consolidation, and tar applied [illegible] upon surfaces from which the [illegible] had been excavated and removed were tried, while several lengths of road surface were also treated with tar in various forms. Other lengths were sprinkled with water to which had been added certain proportions

of various kinds of chemicals. The results of these dust-preventing experiments were not wholly satisfactory. The tarred limestone and slag were both found to be very suitable upon roads where the traffic was more or less light, but upon roads with a very heavy traffic the tarred slag was infinitely better than the limestone, becoming too compact upon consolidation to be affected by the sucking action of motor cars. The surface, however, after slight rain was found to be somewhat slippery for horse traffic. Spraying the surface with tar was very successful, but the experiments proved that the weather had a considerable bearing upon the results obtained. When portions of the surface of the road were swept hard to remove all dirt and dust until the metal was exposed and the hot crude or distilled tar was poured on and well brushed in, and then being left sufficiently long to admit of the tar penetrating into the road as far as possible the surface was sprinkled or dusted with sand. When first laid and before being blinded the tar was found to lick up and adhere to the pairs' boots, causing damage thereto; while during bad weather in the autumn it churned up under heavy traffic. The various chemicals and liquids tried were certainly found to be [illegible]



dust, but in no case was the success achieved of sufficient magnitude to justify a continuance of their use to any very large extent or for any length of time. The experiments, however, proved conclusively that if properly executed, under favourable conditions, tarring the surface effectually and economically prevented dust, and upon open and wind-swept lengths preserved the surface and prolonged the life of a road. It is interesting to note that one length of road laid with tarred slag in 1905, upon one of the most heavily trafficked roads leading out of the Metropolis, has never since required entire renewal. It has, however, required patching, and it has been surface-tarred annually.

Although for the first few years the county council, in common with other county councils, only contributed (usually one-half) towards the cost of laying dust-preventing materials on "unclaimed" main roads, nearly all the districts availed themselves of the offer, and the remainder of the cost was either borne by the local authorities or contributed locally. The result was that tarring the surface gradually became fairly general. A curious point, however, arose as to the legality of a district council contributing towards the cost of tarring upon main roads in their district which were vested in the county council, but upon being approached the Local Government Board ruled "that the contribution would be quite in order if it could be shown that the operation was of such a character as to constitute an improvement within the meaning of sec. 3 of the Highways and Bridges Act, 1891."

This form of road maintenance was largely increased, with the result that it was found in practice that surface tarring, besides mitigating the dust nuisance, effectually prevented tracking and disintegration, while a great deal of watering, with its accompanying ill-effects, was avoided. This led to the county council raising their contribution to two-thirds of the cost through towns and villages where tarring was undertaken partly for the purpose of dust-laying for the convenience of the inhabitants, and paying the whole cost on open and uninhabited roads where the preservation of the surface was the primary object. Eventually the county council decided to pay the whole cost of surface tarring, and, with the exception of those roads upon which more permanent surfacings have become imperative on account of the enormous traffic, almost the whole of the roads in the county are now treated at least once and in many instances twice every year. The durability of the treatment varies considerably, according to the situation of the road and the extent of the traffic. Hand appli-

cation is that usually employed, but various machines are now upon the market to which sprayers and brushes are attached, and these enable the tarring to be carried out much more expeditiously, which is a great advantage in our variable climate. Compounds containing ingredients other than tar are also extensively used, and in some cases are more effective and durable than either crude or refined tar, but the initial cost is, of course, higher. Granite chippings are also substituted for the sand used for binding purposes, which adds to the cost of the work. The waterproofing of the surface of roads, however, leads to a consequent reduction in the scraping and sweeping hitherto necessary, and this saving should be set off against the cost of the tarring.

MODERN METHODS OF CONSTRUCTION AND MAINTENANCE.

In reviewing the latest developments introduced to meet modern traffic requirements it will be the author's endeavour to give as briefly as possible a description of some of the well-known methods which have been adopted in Surrey, and to give comparative figures of cost. It should, however, be borne in mind that the figures quoted are from actual experience when prices of materials were normal before the outbreak of the war.

Water-bound Macadam.—The method of coating roads with granite, basalt, or other tough material, water-bound and surface-tarred, is very suitable for roads with a moderately light traffic, and is that still generally adopted. The selection of the material to be used requires great care, and regard must be had to the quantity and weight of the traffic using the road. The manner in which the material is applied has been previously described, except that the early Spring is now considered the best time for carrying out the repairs. About 9 yds. super. is covered with a cube yard of material, and with chippings or sand used for binding, the cost works out at about 1s. 6d. per yard super. New coats should be surface-tarred as soon as the road has dried sufficiently, and another dressing given in the autumn before the break-up of the fine weather. The cost of tarring, which varies according to the quality of the tar and the kind of material used for blinding purposes, works out at from 1½d. to 2d. per yard super. The covering capacity of a gallon of tar averages between 5 yds. and 6 yds. super., and 1 ton of grit covers from 200 to 250 yds. super. The life of such a road may be generally accepted as from three to five years or more, but varies according to the traffic and other conditions prevailing. After the first year an annual tar-dressing is very beneficial, the surface being thus maintained waterproof, and consequently withstanding the effects of traffic and weather very much better. Until recent years the final consolidation of the metal was effected by the passage of horse-drawn iron-tyred vehicles, but this kind of traffic has of late been so materially displaced by self-propelled vehicles, which now form by far the larger percentage of the traffic, that such consolidation has become quite impossible, the material being pushed into ridges and leaving a very uneven surface at completion. Upon roads bearing heavy traffic the benefit accruing from surface-tarring is comparatively small, and a more substantial waterproofing method is necessary to preserve the surface for any length of time.

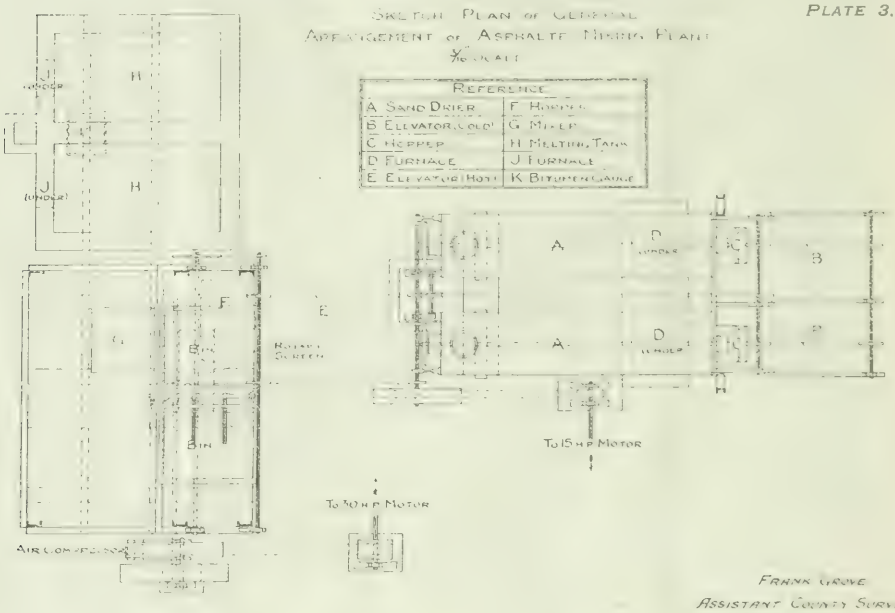
Tar-macadam.—On the roads with moderate traffic this material has been largely substituted for the water-bound method. Before applying this material the existing surface is scarified, formed to a proper cross-fall, and rolled. The most suitable aggregate is selected blast furnace slag, thoroughly dried, heated and coated with distilled tar or tar compound. It is usually made in three gauges—viz., 2½-in. (from 2½-in. to 1½-in.), 1½-in. (from 1½-in. to ½-in.), and ¾-in. (from ¾-in. to ⅛-in.). In two-coat work, which has a finished thickness of about 4 in. after consolidation, 2½-in. material is used for the bottom layer and 1½-in. for the top. Each layer is rolled separately with a roller of about 8 to 10 tons in weight, but before the top layer is thoroughly consolidated just sufficient ¾-in. material is sprinkled on the surface to fill up all the interstices and rolled so as to form a perfectly waterproof surface. The percentage of the various grades used are, approximately, 60 per cent of large, 35 per cent of medium, and 5 per cent of fine material, but these quantities may be varied to suit the requirements. In the case of one-coat work with a finished thickness of about 3 in., material of mixed gauge graded from 2½-in. down to ¾-in. or ½-in., is used, with a sprinkling of topping material as before. After being subjected to traffic for a month or two, and when perfectly dry, the surface should be dressed with tar and chippings so as to fill up all voids completely, and to form a waterproof and durable wearing surface. One ton of material will surface about 8 yds. super. 3 in. thick, and the cost is from 3s. to 3s. 6d. per yard super., according to the cost of material and the difficulties of laying owing to the previous state of the road and amount of interruption by traffic. A tar-macadam road will, with care in patching and annual surface dressings, last from five to eight years or even longer, according to the amount of traffic, after which it can be re-topped, or, if found advisable, used as a base coat for a more permanent form of bituminous surfacing. Slag tar-macadam is very suitable for roads with a great deal of motor traffic. Compared with water-bound granite, the initial cost is about double, but there is a saving in the annual cost of cleaning, patching, &c., and where it is found that water-bound macadam will not last longer than three years, it is undoubtedly more economical to substitute tar-macadam.

Limestone tar-macadam is also largely used in the same manner, but it is only suitable for roads with a light motor traffic, and where the situation is well exposed to quick-drying influences.

Granite tar-macadam has also been tried with but very few satisfactory results. The aggregate does not appear to be sufficiently porous or the surface sufficiently rough to retain the compound, the result being that under heavy traffic the material loosens and the surface becomes uneven. It does not seem practicable to keep a waterproof surface through the winter where the traffic is considerable, so it would appear to be only suitable for light traffic in exposed situations.

Pitch-grouted Macadam.—This can be laid in single or double coatings, according to the requirements of the traffic. In single pitch-grouting the existing surface of the road is scarified, and the excavated material, after being sifted to remove all stones below 1 in., is re-spread together with sufficient new granite or other suitable material of about 1½-in. gauge, and

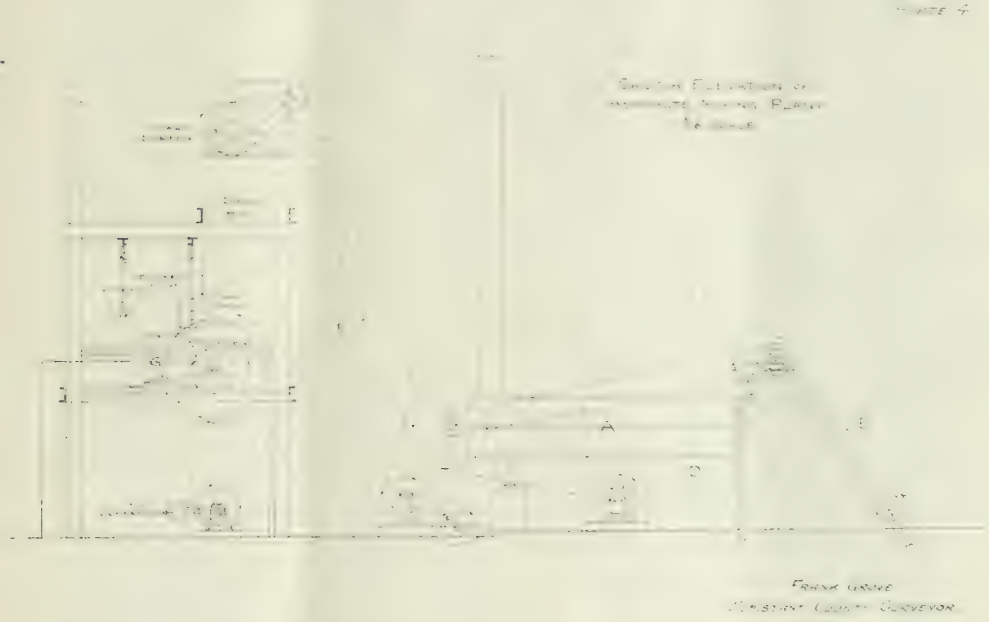
PLATE 3.



Frank Grove
Assistant County Surveyor
Surrey

rolled dry until the stone is fairly firm. The grouting mixture, consisting of pitch, oil and sand, is then poured on to the partly rolled surface, using as little of the mixture as possible to fill all voids to within about ½ in. of the top of the stone, and the surface is then lightly sprinkled with clean ¾-in. chippings. Before the grout has time to set the roller is again applied, and sufficient chippings added during the process of rolling, which is continued until the grout is squeezed up to the surface, and becomes thoroughly cooled and consolidated. After being thrown open to the traffic the surface is dressed with a further coat of pitch and oil or tar and chippings to secure a smooth and even waterproof face. Double pitch-grouting is identical except that the aggregate is laid, grouted and rolled in two separate layers. The material for the bottom coat is of 2-in. gauge, and for the top coat 1¼-in. material is used. The finished thickness of single pitch-grouting is about 3 in., and of double pitch-grouting from 4 in. to 4½ in. The method of preparation and finishing is exactly similar in both cases. In preparing the grouting mixture all the pitch and half the oil is first placed into a 600-gallon boiler, which is large enough to heat, safely, about 500 gallons, and is heated to a temperature of 300 deg. Fahr., after which the remaining half of the oil is added, the mixture being thoroughly stirred during the process of heating. Clean, sharp sand, heated in sand driers to a temperature of 400 deg. Fahr., to which is added a very small percentage of Portland cement, is then mixed with an equal proportion of the pitch mixture in a dandy or portable mixing vessel, the mixture being stirred right up to the time of actual pouring upon the roadway, which is done as evenly and quickly as possible by means of ladles or pouring cans. As a rule 1 lb. of oil is generally found sufficient for every 10 lb. of pitch, but great care must be taken that the mixture is not too brittle, which can be remedied by adding a further small proportion (about 1 in 50) of oil. A method generally adopted of testing the pitch mixture is to draw off a little, and after allowing it to cool a piece is held between the finger and thumb of both hands and stretched until it draws out to a fine thread at least 3 ft. long before breaking. The approximate quantity of pitch required for a consolidated thickness of 2 in. is 1½ gallons per yard super., for 2½ in. 1¾ gallons, for 3 in. 2 gallons, for 4 in. 3¼ gallons, and for 4½ in. 3½ gallons. The cost works out at between 3s. 6d. and 4s. per yard super. The great drawback to pitch-grouted macadam is the extreme difficulty experienced in obtaining a perfectly regular distribution of the pitch mixture, any excess of quantity being followed by a tendency of the surface to corrugate and even pull in hot weather, while with an insufficiency of the mixture the surface is not rendered completely waterproof during the winter. For these reasons the surface seldom remains so good as well-constructed tar-macadam.

Wood Block Paving.—This is, perhaps, the best form of construction for roads with a great amount of traffic, particularly upon motor-omnibus routes, but, on account of the initial cost being high, is only at present laid upon roads of an urban character, and through towns where the rateable value of the district is sufficiently high to permit of a proportion of the cost being borne by the local authority. Hitherto hardwood paving was most generally adopted, but of late years the use of softwood, which wears more evenly than hard, has been very extensively increased. The deal blocks are creosoted under pressure, and are laid upon a 6 to 1 Portland cement concrete foundation, 6 in. to 9 in. thick, floated to a smooth surface. The paving is grouted with a mixture of pitch and oil up to about ¼ in. from the surface, and the remaining space is filled with a liquid mixture of cement and sand. The cost of this class of paving has rapidly risen during recent years from 9s. 6d. to 13s., or even more, per yard super. The Local Government Board sanction loans extending over a period of ten years for softwood paving and twenty years for the concrete foundations, and this enables the cost to be spread by repayments of equal annual instalments of principal and interest over a long period. The useful life of wood paving may be taken to be at least ten years, and under moderate traffic may extend up to nearly twenty years. It is to be doubted, however, with the much heavier and speedier vehicles now in use, whether the life of this class of paving will be so extensive as it has been in the past. It may be instanced, however, that Castelnau, Barnes, has been laid over seven years, and has had no repairs to date except where trenched, although it has had a large motor-omnibus traffic ever since it was laid.



Bituminous Surfacings.—The surfacing of roads with asphalt or mineral bitumen has proved very suitable for the heaviest traffic, and particularly motor-omnibus routes. It can either be laid as a carpet coat, 1½ in. or 1¾ in. thick, directly upon the existing road crust, if sufficiently strong, or upon a base or strengthening coat, 2 in. to 3 in. thick, of asphaltic concrete. In the latter case the carpet coat can be reduced to 1 in. in thickness. The base coat consists of about 70 per cent of new stone or excavated road metal, and about 30 per cent of sand and chippings thoroughly dried

and heated before being mixed with hot bitumen. The carpet coat is composed of sand and bitumen, sand forming from 80 per cent to 90 per cent of the bulk. A small proportion of Portland cement or other suitable very fine material is used as a "filler" with the sand. The sand, after being dried and heated to a temperature of about 270 deg. Fahr., is thoroughly mixed with the bitumen heated to a similar temperature. The mixture, in a hot state, is spread and consolidated until a perfectly smooth and waterproof surface is obtained. Contractors manufacture and lay the material complete, or deliver the material ready for laying, but several county and borough councils in various parts of the country have recently had plants installed for the manufacture of this class of paving. In Surrey two plants have just recently been purchased upon the recommendation of the county surveyor, respectively, for the manufacture of the base and carpet coats, and skeleton diagrams, showing their method of working, are appended to this paper, and numbered 1 to 4. The plant for the manufacture of the base coat, which is of a portable character, as shown in Plates 1 and 2, consists of a bucket elevator (A) (having a cubic capacity of ½ yd.) which hoists and drops the aggregate into a hopper (B), from whence it is delivered into a revolving drum (C_1), and, after a certain amount of drying, is passed through another revolving drum (C_2), and discharged into the mixer (D), where the bitumen, after being heated in a portable boiler, is added and thoroughly mixed with the aggregate by means of two revolving cranks fitted with blades. While in the drums the aggregate is dried and heated, the heat being supplied from a furnace (E), and being drawn through the drums by means of a fan (F). When ready for use the material is discharged through flaps which open at the bottom of the mixer into the waiting motor lorry or cart, which can be backed right under the mixer.

The plant for the surfacing material, shown in Plates 3 and 4, is of a semi-portable character, and consists of two large cylindrical revolving sand driers or drums (A) into which the sand, hoisted from the ground by means of chain and bucket elevators (B), is delivered through hoppers (C), the drums being heated from furnaces (D). After being thoroughly dried and heated the sand is again hoisted by a bucket elevator (E) into a hopper (F), which discharges into the mixer (G), where the bitumen previously heated in two tanks (H) from furnaces (J), is added by means of a travelling and tipping bucket (K). When thoroughly mixed and ready for use the material is delivered through the collapsible bottom of the mixer into motor lorries as before described. These plants having been only very recently installed, it is too early to give absolutely accurate figures of cost, but it is anticipated that they will amount to, approximately, 1s. 6d. for the base coat and 3s. for the wearing surface per yard super. It is expected that the life of a road constructed with this class of material will be at least seven years. The covering capacity of 1 ton of material is as follows:—

Base coat, 2 in.	consolidated thickness.	10 yds.	sup.
,, 2½ in.	,,	8	,,
Surface coat, 1 in.	,,	20	,,
,, 1¼ in.	,,	17	,,
,, 1½ in.	,,	14	,,

Hitherto the prices for this class of work carried out by contractors has been from 5s. 9d. per yard super. upwards.

Generally. During the last few years every available opportunity has been taken to widen carriageways and also to reduce the camber of roads generally to about 1 in 32 with a view to encouraging, as far as possible, the distribution of the traffic evenly over the full width of the metalled surface. The reduction of camber has usually been executed by raising the sides or haunches, using large unbroken flints or other suitable material, such as limestone spalls, and thus avoiding any weakening of the subcrust of the road. Where, however, such a course has been impracticable owing to the presence of kerbs, the old road surface has been removed and the thickness of the new surfacing material increased. Upon rural roads, where bordered by grass margins and ditches, a considerable improvement has also been effected by the provision of continuous submerged reinforced concrete in situ kerbs to form an abutment for the surfacing material, and, by affording lateral support to the road, effectually preventing the heavy traffic pushing the road crust into the margin. With all methods of construction where bitumen or pitch is used in a hot state there is a very great tendency to the formation of depressions or waves, which are believed to be started by the process of rolling with an ordinary steam roller in the initial stages, and a three-axle roller has been designed which is claimed to reduce the formation of these depressions or waves to a minimum.

THE ROAD BOARD.

Constituted by the Development and Road Improvement Funds Act, 1909, for the purpose of promoting the improvement of roads in the United Kingdom, the Road Board, up to the present, so far as the county of Surrey is concerned, have chiefly concentrated their attention upon the improvement of road surfaces, and by way of grants out of the funds at their disposal have considerably assisted in the very marked improvement which has of late years been effected. Grants amounting to three-fourths of the difference between the improvement and ordinary costs have been made during the last four years towards various forms of improved surfacings, such as asphalt, pitch, and other grouting, and tar-macadams; while in the case of a scheme prepared last year by the county surveyor for the reconstruction of about 26½ miles of main roads, extending over a period of three years, the board agreed to a loan, free of interest, and repayable in five equal annual instalments, for the purchase of the necessary plant hereinbefore mentioned, and also by way of grants and free loans repayable in six years have agreed to contribute to the cost of construction, the repayment of the loans being so arranged that the cost of these roads to the county will only very slightly exceed the present cost of repairs, and will remain stationary for the period named.

The Road Board have also from time to time arranged with various county and borough councils for a number of trial lengths of roadway to be laid under the general supervision of their Advisory Engineering Committee, composed of prominent road engineers, so that the knowledge and experience gained, and the results achieved, by these experiments could be published and made use of by all road engineers, who have been welcomed to visit the works both during their progress and at any time afterwards.

The engineering department of the Road Board have also prepared for the use of surveyors and others engaged in the work of road construction and maintenance general directions for surface tarring, surfacing with tar-macadam, pitch-grouting of roads, and specifications for tars and pitch; while in 1911 a laboratory was inaugurated as a division of the National Physical Laboratory at Bushey Park, Teddington, where a road-testing machine was installed for comparing the efficiency of methods of construction.

Another important matter the Road Board have now under consideration is the question of preparing a detailed schedule of all the public roads in England and Wales, and their division into classes, according to relative importance, with a view to its use in the distribution of grants and as a basis for any future grants in aid of maintenance expenditure from the National Exchequer.

In conclusion, the author would like to express his indebtedness to the authors of various works (including "Highways and Byways of England," T. W. Wilkinson; and "Roads and Streets," D. K. Clark) in the preparation of that part of this paper dealing with the history of roads; also his appreciation of the kindness of the county surveyor in allowing him the opportunity of contributing this paper.

A report of the discussion which followed the reading of Mr. Grove's paper at last Tuesday's meeting of the Society of Engineers will appear in next week's issue.

Coatbridge Sanatorium and Dispensary.—The new tuberculosis sanatorium and dispensary at Coathill, erected for the burgh of Coatbridge, was formally opened on Saturday by Provost Davie. The buildings were designed and erected by Messrs. Wm. Bain & Co., Limited, Lochrin Ironworks, Coatbridge. They are the only buildings of their type yet erected to meet the requirements of the National Health Insurance Act. The hospital pavilion has accommodation for twenty-eight patients, and consists of two large wards with a connecting dining-room at the end of each ward.

Work of the Royal Commission on Sewage Disposal.

STANDARDS OF PURITY FOR MANUFACTURING WASTES.

By ARTHUR J. MARTIN, M.Inst.C.E.

[illegible] Report of the Royal Commission on Sewage Disposal [illegible] of more than passing notice, for it marks the close of a protracted and extensive investigation into a subject of unusual difficulty whether we regard it as to its technical aspect or in the light of the number and importance of the interests involved.

It is no reflection on the commissioners to say that they have not accomplished all that some engineers people expected of them, and that their Final Report leaves many a vexed question still unsettled.

The question of manufacturing wastes which forms the subject of the Ninth Report may be regarded as a minor one as compared with that of domestic sewage, but the difficulties which it presents are greater than those met with in the case of the latter, and the consequences of a mistake in dealing with it may be even more serious.

A high standard of purity for sewage effluents may lead to [illegible] while requirements which are unduly onerous will increase the cost of purifying the sewage. But the [illegible] necessary will rarely entail very serious hardship. In another case we [illegible] about the [illegible] community.

But in the case of a trade waste the enforcement of too high a standard of purity may have a disastrous and far-reaching effect on the industry concerned. Our manufacturers have to face competition which is already pretty severe. Often they labour under difficulties from which their foreign rivals are exempt, or at all events are not affected to the same extent. War taxes must before long press on them more severely by reducing the standard of purity for their waste liquors might easily be the last straw to the load of a struggling industry.

Obviously there must be some control. A manufacturer cannot be allowed to carry on his business in utter disregard for the amenities of the neighbourhood. But we cannot eat our cake and have it too. We must not expect to have numerous and thriving industries in our midst and yet preserve the charm of the countryside absolutely untouched.

[illegible] practically consist in weighing the [illegible] and the careful [illegible] of pros and cons. The commissioners have performed their task with a full sense of responsibility and an evident desire to hold the balance even. Their [illegible] recommendations are [illegible] to be the best which could be framed, but it would be premature on a first perusal of their report to pronounce an offhand judgment on recommendations based on the results of sixteen years' [illegible].

It is not an unmixed hardship that manufacturers should have to give heed to their waste products. The compulsion under which the gas industry found itself to make better provision for the disposal of its tar has revealed in this troublesome and despised residuum a mine of unsuspected wealth. It is true that we have allowed certain important branches of the coal-tar industry to slip through our fingers, and that alert and able competitors on the far shore of the North Sea have reaped the lion's share of the profits. But that mistake may yet be rectified. The waste products of other manufacturing processes may not all be so valuable as coal tar has proved. But it is all to the good that those responsible for these products should be compelled to call in science to aid in their disposal.

DISPOSAL IN RURAL AREAS.

The commissioners have given timely consideration to the difficulties under which a small population labours in dealing with its sewage. It is often a hardship for a poor village to have to provide and maintain works of a kind which may fittingly be called for in the case of a town or city. But, on the other hand, the village cannot be allowed to become a plague spot and a centre of infection which may spread far beyond its own borders.

The late Dr. Vivian Poore has shown how the solid and liquid wastes from a small community may be disposed of cheaply, effectually and without nuisance, and how they may even be made to yield a profit. But the methods which he employed require intelligent management and an unremitting care which it would be idle to expect in the generality of rural districts.

It may not be amiss to point out that in the Army also the refuse of large bodies of men is disposed of promptly and inoffensively by means of appliances which can be improvised in an hour or two without expense beyond that of the necessary labour. But here again the need for strict discipline and constant supervision is clearly shown.

The price of health is eternal vigilance. If small and poor communities are to be allowed to dispense with the sanitary equipment which larger populations are compelled to provide, they must not complain if the less stringent requirement is [illegible] a closer supervision.

There is another lesson which we may learn from the Army. A Commander-in-Chief does not launch a plan of campaign and then leave it to work itself out regardless of any developments which may occur. The purification of sewage has hitherto been carried on under difficulties which were largely due to the adoption of a rigid plan of campaign, and to the failure to revise our methods in the light of experience and of later scientific discoveries. The most important recommendation of the commissioners is designed to guard against the recurrence of the policy which has proved so disastrous in the past, by the establishment of a central authority competent to keep our practice in the disposal of sewage and trade wastes abreast of modern progress. The times are not propitious for legislation on such a subject, but Parliament might well spend a [illegible] time in giving effect to the [illegible] recommendations.

A BASIS FOR FUTURE DEVELOPMENTS.

By A. P. L. COTTERELL, M.Inst.C.E., President of the Institute of Sanitary Engineers.

The announcement of the completion of the task upon which the Royal Commission on Sewage Disposal has been engaged for over sixteen years certainly marks an epoch in the history of sanitary work. The nine reports issued by the commission, with their valuable appendices, have not only done much to standardise practice, but will form, for many years to come, a sound basis for future developments.

In your leader you have already referred to the character of the various reports, and have pointed out both their strength and their weakness. To most of us, perhaps, the Fifth Report and its supplement, the Eighth, stand out as the most important—the first as regulating existing methods of disposal, and reducing them, as it were, to a common factor, the second as boldly proposing to make the degree of purification dependent upon the character of the stream into which the effluent is to be discharged. These proposals brush aside the narrow views that are at present crystallised in the law of the land, which the commission consider should be altered. After all, to make the work to be done commensurate with the conditions to be met, and not with a hard-and-fast rule that makes no difference between the evil and the good, is what we engineers are constantly striving to do. It is only common sense, and should appeal to us all.

TRADE WASTES.

I should like to make a few remarks upon the chief subject dealt with in the Ninth Report—viz., the discharge of manufacturing wastes which cannot be taken into the sewers.

The committee first took up the question of trade wastes in their Third Report. They made a pro-

nouncement that the law should be altered so as to make it the duty of the local authority to provide in their sewers for trade effluents as well as domestic sewage, and that the manufacturer should be given the right, subject to safeguards, to discharge trade effluents into the sewers. I cannot help thinking that the commission, on going more fully into it, felt that this pronouncement carried them a little too far. Although perfectly reasonable in the majority of cases where manufactures are situated in large towns, such a right indiscriminately conferred upon the manufacturer might put an undue burden on the ratepayer, and enable the former to place upon the public an expense that he himself should incur. At any rate, the commission think it well, in their Ninth Report (paragraph 10), to suggest that the local authority should be empowered to make a charge on the manufacturer for the special services rendered, whether the effluent had received preliminary treatment or not.

It may well be that the authority is in a better position to treat the trade waste than the manufacturer, but to allow the latter to pass it off on to the public without further liability, except as a general ratepayer, would not tend to care on the part of the manufacturer to reduce his wastes to the lowest and least offensive limits.

The case of coal washing is one in point. There are some parts of the country where efficient plant has been set up by the colliery owner for the settlement and filtration of the effluent, with the result that it is fit for admission direct to the stream; there are other parts where there is no such plant, or only of a primitive kind, and the colliery owner seeks for the admission of his waste into the sewers, since it is quite unfit to go into the river. By the discharge of such a bulk of liquid as is required in coal washing, and such a quantity of mineral detritus, a far greater expense would be incurred in sewerage and sewage disposal than is in the least necessary, while the river itself would be depleted of water that should naturally flow along it. The result, moreover, is uneconomical, for by properly designed settlement tanks a valuable residue is recovered that can be used for briquettes and other things, and all this would be lost if it were once mixed with sewage.

BY-PRODUCTS.

In fact, this recovery of valuable material from trade wastes is one that ought to receive more and more attention, and is, I believe, likely to do so as a result of the war. Already I hear that processes are being adopted to recover material that was formerly thrown away. We know that efforts at recovery of valuable waste is always in the eye of the manufacturer to a greater or lesser extent; but we in this country may not have been quite so careful as elsewhere until shortage, due to the conditions brought about by the war, have made it worth our while to do so. Such a tendency ought to be encouraged, and no encouragement should be given to manufacturers to overlook a potential by-product simply because it is troublesome to recover.

We all know the experience of Bradford, how they have managed to turn what was almost a curse into a blessing, and are obtaining from the fats contained in their sludge enough revenue to practically cover the upkeep of their sewage works. This is an example of where it pays the local authority to take wastes from the woollen trade into their general sewerage system, because it does not interfere with the sewage treatment, and the valuable ingredients can be recovered from the sewage. No compulsion or extra charge is necessary in this case. If it pays Bradford to do this it may also pay isolated works of sufficient size to institute recovery on its own account.

In the case of tin plate and similar works it is possible to treat the wash waters and really effect a saving in the amount of sulphuric acid consumed. Some works are already realising this. In whatever direction the effluent is finally sent, whether into the sewer or the river, both the sulphuric and the muriatic acids should be neutralised, and the discharge regulated over prolonged periods by the construction of tanks.

It seems to me that the detailed attention bestowed by the commission on various kinds of trade waste will give a lead to the manufacturer to look more carefully into the subject. It certainly ought to result in better effluents, and, perhaps, in the elucidation of processes for purifying efficiently those wastes that in the present state of knowledge cannot be properly dealt with.

The general trend of this portion of the Ninth Report is far greater efficiency. It need not necessarily mean greater expense, but where it does involve outlay such outlay may either be wholly or partly repaid, or it is an expense properly allotting to the manufacture that should not be avoided.

The commission has repeatedly advocated the establishment of a central authority and of district authorities, or Rivers Boards, empowered to deal with questions of refuse disposal and of water supply. They reiterate this in their Final Report, and, in fact, make it the pivot upon which the proper working of their proposals, both as regards domestic sewage and of trade wastes, shall be based. Their proposals in this respect have been so constantly endorsed whenever the subject has come up for discussion that we may hope they will be carried into effect.

FUTURE INVESTIGATIONS.

There is one more point. The commissioners, in drawing their labours to a conclusion, refer to the question of new sources of pollution. That these will occur is obvious, as well as constantly changing conditions at existing sources. It makes one wish that the research work developed by the Royal Commission should not be allowed to drop upon their departure. Perhaps the central authority will take it up—when it is established. But even if the Royal Commission cannot be usefully prolonged on its present basis, it is needful that some other official body should take up as quickly as possible the work it has begun. Treatment of the whole subject of sanitation by Parliament is overdue. If this field be too great for the present occasion, there is sufficient non-contentious ground indicated by the Royal Commission for Parliament to work upon. Meanwhile, we may all be grateful to the Royal Commission for what they have done, for the thoroughness of their investigations, and, with minor exceptions, the practical nature of their proposals.

POINTS FROM THE REPORTS.

By H. Gilbert Wyatt, M.Inst.C.E.,
Borough Engineer and Surveyor, Great Grimsby.

Many years ago, when I was less than half the age I am at present, and had only recently come into contact with the sewage problem, I commenced to write a paper in which I called attention to the enormous sums of money which were being spent in the country on sewage experiments, and suggested that the Local Government Board should carry out these experiments at the expense of the nation, and settle once and for all what was the best method of treating sewage so as to make it innocuous.

My paper got no further than manuscript, as I discovered that, as the result of inquiries held in 1858, 1861, 1865, and 1870, "the right way to dispose of town sewage is to apply it continuously to land, and it is only by such application that the pollution of rivers can be avoided"; and that the Local Government Board was not prepared to consider any other system.

At a later date, when holding the position of deputy borough engineer at Salford, I was brought into contact with the Salford experiments, and I read a paper on February 12, 1898, in which I called attention to the work of Mr. Robert Warington, Mr. Dibdin, the State Board of Health of Massachusetts, Colonel Ducat, Baldwin Latham, and Mr. Joseph Corbett, then borough engineer of Salford, and the fact that bacterial treatment in filters was equally efficient as land treatment: and I concluded the paper by claiming "that the time had arrived when the Local Government Board should be roused from its state of agnostical immobility and should seriously take upon itself to examine whether there is the efficiency in bacterial filters that is claimed for them."

Within one month from that date (and though I can say *post* I dare not say *propter hoc*) it was announced in the House of Commons that the Government intended to appoint a commission which was to inquire into the whole question.

Sixteen and a-half years have elapsed since that date, and the Royal Commission on Sewage Disposal has issued its Ninth and its Final Report.

Several points stand out clearly:—

(1) That the Local Government Board is now prepared to consider and accept almost any system which can reasonably be laid before them, if supported by experiments and analyses.

(2) That the available methods of sewage purification are as diverse as is sewage itself; and we know the sewage of any ordinary town varies from hour to hour during the day.

The Surveyor
and Municipal and County Engineer.

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(3) That the fixing of a standard of purification or of pollution is not necessary, although recommended in the Ninth Report, as so much depends upon the bulk of the main stream when compared with the quantity of effluent discharged into it.

(4) That the question of manufacturing wastes needs further consideration, and that a new Rivers Pollution Prevention Act is necessary.

(5) That the commissioners have carried out their work on a thoroughly efficient scale, their reports, which together form a monumental volume, though stereotyping nothing, yet include every phase of the sewage purification question; and an engineer has only to read between the lines, mingling imagination with his knowledge, to be able to deal with the sewage of any town, remembering that an engineer is one who can do for ten million what any other man can do for a sovereign.

EXHIBITS AT DUBLIN SPRING SHOW.

In conjunction with an exhibit of road metal preparing machinery shown by Messrs. W. H. Bevis, Limited, of Leeds, on Stand 150 at the Dublin Spring Show—which opened on Tuesday—there is also on view a 5n.h.p. compound steam traction engine made by Messrs. Marshall, Sons & Co., Limited, Gainsborough. This engine has high and low pressure cylinders of, respectively, 5½-in. and 8½-in. diameter, with a 10-in. working stroke, and is suited for a continuous steam pressure of 180 lb. per square inch. The cylinder casting, which incorporates the steam chests, is mounted on a pressed-steel fixing with planed face, riveted to the boiler shell.

The slide valves are readily accessible from the top of the cylinder casting, the covers being arranged so that the valves can be examined or adjusted without disconnecting any of the rods, and, if necessary, while the boiler is under steam.

A by-pass or auxiliary steam valve is provided to enable boiler pressure steam to be admitted to the low-pressure cylinder, in order to give temporary increased power for starting with a heavy load, or when crossing difficult ground, as well as to facilitate the ascent of a steep incline.

The cylinder lubrication of this engine is effected by a mechanically operated positive action oil-feed pump; the power transmission mechanism includes a four-pinion compensating gear, and for feeding the boiler an automatic injector and feed-water pump are provided. The engine is also equipped with a cross-arm quick-speed governor acting on an equilibrium throttle valve, water lifter, winding drum, and other usual accessories.

INSTITUTION OF CIVIL ENGINEERS AND PROFESSIONAL CHARGES.

COUNCIL'S STATEMENT TO CORPORATE MEMBERS.

A memorandum as to professional charges of corporate members of the Institution of Civil Engineers has been issued by the council of that body. The council trust this may be of assistance to the members, and may conduce to uniformity in the basis upon which such fees are fixed, and they are at the same time of opinion that this authoritative declaration upon the subject will be serviceable generally.

The council are of opinion that the nature of professional engineering services renders it difficult to lay down any comprehensive scale of fees to cover the varied conditions under which such services are given. Engineers with larger experience command fees for such work on a higher scale than younger and less experienced engineers; but it may be expedient that some authoritative statement should be made by the council as to professional charges, which will afford some recognised measure of the value of certain engineering services.

The council accordingly state that the customary remuneration for ordinary professional engineering services, as distinct from remuneration by salary, for the design and superintendence of the construction of works in the United Kingdom is a commission of 5 per cent upon their cost, which commission, however, is liable to be varied in accordance with the nature and magnitude of works and the character of the services rendered, as follows:—

(1) In the case of undertakings where the services rendered by the engineer are large relatively to the extent and cost of the work, or in the case of undertakings involving a considerable amount of intricate and detail work, the commission of 5 per cent may be increased. On the other hand, in the case of exceptionally large undertakings, the commission may be reduced by agreement.

(2) The preparation of bills of quantities, payments to resident engineers and inspectors, and also personal travelling expenses, are matters for arrangement depending upon the nature of the work and the circumstances under which it is carried out, and may be included or not included in the engineer's remuneration according to the extent and difficulty of the works and the amount of detail work involved in the preparation of the plans, drawings, specifications and bills of quantities, and also the amount of superintendence by the engineer's staff necessitated by the character of the work.

Where the works are designed in sufficient detail to enable a contract for their execution to be made or to enable the Local Government Board to hold an inquiry into the propriety of allowing an authority to borrow money for the purposes of the works, but where the carrying out of such works is deferred indefinitely or abandoned, the fee for services up to this stage is one-half of the ordinary commission.

The council are advised that plans and specifications prepared by an engineer belong, as chattels, to the client, after payment of the agreed fees; but the copyright in all original matter contained in such plans and specifications remains vested in the engineer. Neither the client nor any other person is entitled to multiply copies of plans and specifications so far as the original matter therein contained is concerned, and, further, if such original matter has "an artistic character or design" the plans can only be used for the purpose of the particular structure for which they were prepared by the engineer, or for such other purpose as he may authorise. Original matter in specifications is defined by counsel to be a composition or arrangement of the author—something which has grown up in his mind, and would, if applied to patent rights, be called invention.

Charges for reports on engineering proposals must necessarily be largely dependent upon the extent of the inquiry and research upon which the reports are based, and upon the professional standing of the engineer employed, and cannot, therefore, be dealt with in any scale of fees.

Remuneration for services in preparing for and giving evidence before Parliamentary Committees or other tribunals generally consists of a preliminary fee, and a charge per diem while engaged upon the preparatory work and during the hearing of the inquiry, as well as all out-of-pocket expenses.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:

466. Road Making. Describe a few simple tests that will enable an engineer to ascertain the quality of the bitumen and filler to be used in a bituminous macadam road. (Eneer.)

469. Sewage Sprinklers.—Give a good practical method of marking off the holes in the distributing arms of revolving sprinklers. The diameter of holes to be constant. (C. A. B., *Carlisle.*)

471. Building Construction. What is a [illegible]? Explain its function, and give sketches in illustration. (M. T. R., *Blyth.*)

473. Retaining Wall.—Explain carefully the different ways in which a concrete retaining wall may fail, and state how such failures may be avoided. (M. T. R., *Blyth.*)

REPLIES TO QUESTIONS.

472. Statics. Discuss the relative advantages of the graphical and analytical methods in the determination of the stresses in a framed structure. (M. T. R., *Blyth.*)

Stresses in the members of framed structures may be found (1) by pure mathematics, analytically; (2) by graphic statics. By the analytical method correct results to any number of decimal places may be obtained. By graphic statics the result will vary according to the accuracy of the drawing, but with care sufficiently correct re-

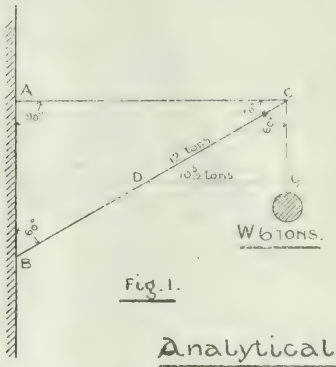


Fig. 1.

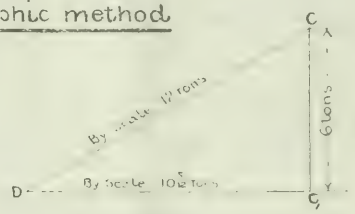


Fig. 2.

Analytically

Stress in BC = W sec 60° = 6 × 2 = 12 Tons

AC = W tan 60° = 6 × 1·732 = 10·392 Tons.

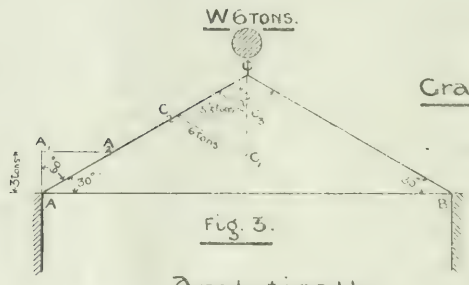


Fig. 3.

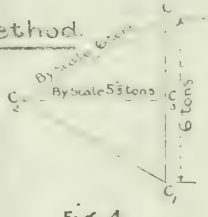
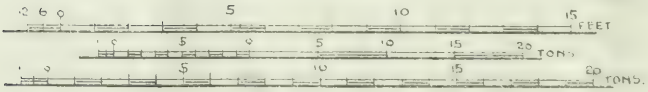


Fig. 4.

Analytically

Stress in AC = ½W sec 60° = 3 × 2 = 6 Tons

AB = ½W tan 60° = 3 × 1·732 = 5·196 tons



error should be very small, and, as a margin of safety of from four to ten times the calculated breaking strength is provided, this error is practically immaterial. Fig. 1. A weight of 6 tons is suspended from the extremity C of an inclined prop BC, the other extremity B [illegible] wall. A [illegible] the AC [illegible] end, the other being fixed to the wall. On the vertical line through C set off $CC_1 = 6$ tons; from

C, draw C D parallel to CA, meeting CB in D, then by scale CD = 12 tons, compressive stress on CB and by scale C D = 10 tons, or 19·41 tons tensile stress on CA. The diagram is shown in Fig. 2 drawn separately, and to a larger scale. By analytical method it will be seen that stress on CB = 12 tons and on CA = 10·392 tons. The analytical method shows an error in the graphic method in the CA and for this reason the two lines CA in the diagram of the graphic method a larger scale should be used or the analytical method the tan was only taken to three decimal places. Fig. 3 represents a simple truss resting on two walls, and supporting at two points V C W, equally inclined to the horizontal at an angle of 30 degs., and a horizontal tie AB connecting the feet of the rafters. With a weight of 6 tons at the apex C and the stresses on the rafters and tie beam. Figs. 3 and 4, with the previous explanation given with Figs. 1 and 2, will be perfectly clear. It will be seen that by analytical method greater accuracy can be obtained than by graphic statics, but for all general purposes the latter is quite sufficiently accurate, quicker and considerably less laborious. E. W. P. [illegible]

THE ROAD BOARD.

GRANTS TO HIGHWAY AUTHORITIES: EIGHTEENTH LIST.

During the months of January, February and March 1915, the Road Board has indicated additional grants to highway authorities amounting, in the aggregate, to £80,143, of which £71,449 was by way of [illegible] and £8,694 by way of loan.

The advances made and indicated up to March 31, 1915, less indications cancelled, amount to £6,034,447. Of this total £4,580,034 is by way of grant and £1,454,413 by way of loan.

The formal grants completed with the approval of the Treasury, during the last quarter, amounting to £190,852 were applied as follows:

Road crust improvements	£ 132,...
Road widening and improvement of curves and corners ...	10,...
Road diversion ...	2,112
Reconstruction and improvement of bridges	1,450
New roads and bridges ...	2,907

County or County Borough.	Amount of grant for			
	Improvement of road-crusts.	Road widening, corners, cutting spoil.	New roads and bridges, improvement of curves and corners.	Total.
ENGLAND.	£	£	£	£
Bolton (C.B.)	–	3,200	–	[illegible]
Durham ...	2,550	10,850	–	13,...
Essex ...	–	2,580	–	2,580
Hertford	82,384	–	–	82,384
Isle of Wight ...	10,000	–	–	10,000
Lancashire ...	2,785	2,368	–	5,153
Lincs (Kesteven) ...	–	26	–	26
London (Area of the Metropolitan Police District)*	21,790	4,980	18,990	45,760
Monmouth ...	7,216	–	–	7,216
Northampton ...	–	5,000	–	5,000
Rutland	–	11	–	11
Salop	70	–	–	70
Southampton ...	462	–	–	462
Staffs	–	520	–	520
Stoke-on-Trent (C.B.) ...	3,083	897	1,020	5,000
Suffolk (West) ...	–	–	365	365
Westmorland	1,502	–	–	1,502
Yorks (W.R.) ...	82	1,724	1,136	2,942
WALES.				
Anglesey	–	7	–	7
Denbigh	724	–	–	724
Flints	5,000	505	–	5,505
Glamorgan	–	–	5,437	5,437
SCOTLAND.				
Argyll	119	697	–	816
Renfrew	150	–	–	150
Ross and Cromarty ...	750	–	–	750
Roxburgh	–	–	500	500
IRELAND.				
Leitrim	55	–	–	55
Longford	600	–	–	600
Louth	5,886	–	–	5,886
Mayo	2,277	–	–	2,277

* NOTE.—This amount of £45,709 is made up as follows:—Brentford £5,422, Chiswick £6,810, Croydon (C.B.) £18,950, Hornsey £1,784, Islington £4,320, Shoreditch £365, Southall-Norwood £1,463, Staines £954, Sunbury-on-Thames £922, Tottenham £478, Willesden £1,361, Yiewsley £80.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Was it not about time that the Institution of Civil Engineers should issue a statement as to the profession[illegible] not had with [illegible] on the [illegible] that has been published, which fixes the commission on works [illegible] ing to the services rendered by the engineer, or where the work is intricate and involves a large amount of detail work? Is it not well, too, that it has also been decided that where a scheme has been prepared and the clients abandon it from no fault of the engineer, he may charge one-half his commission? Have the council of the institution at last awakened to the fact that they have many duties to perform on behalf of the members besides the arranging of papers to be read and attending to other simple departmental [illegible]

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[illegible] on having drawn attention to the want of popularity of the civic engineer, and for having suggested that annual reports and so forth might be written in more literary and popular style? Is it not proverbial, however, that many engineers, who are men of deeds, not words, find it difficult to put their ideas on paper, [illegible] Would it not tend to make engineering more popular if some well-known author could be induced to "write up" the subject? Why could not poetry be substituted for prose? Who was the author of the poem commencing "A microbe basking in a septic tank"?

* * * *

Where is Quarry Bank, and why wouldn't the [illegible] as recommended by their surveyor? What must be the condition of the roads in this place if these necessary auxiliaries to decent roads are not forthcoming?

* * * *

Is it true that there is a movement on foot to standardise the wheel track of all self-propelled vehicles to a gauge of 4 ft. 8 in.? If this is carried out, will not such a proposal have a tendency to damage the roads still more, as every vehicle will then follow in the track of the other? Does not the present variation in gauge tend to prevent this? And will it not be an evil day for road makers if the proposal is carried into effect?

* * * *

Do we not, in reading between the lines of Mr. John A. Brodie's excellent address to the members of the Liverpool Engineering Society, gather that, although he is not inclined to the view that the days of tramways are numbered, he evidently considers that they are out of place in crowded thoroughfares? Is it not interesting to observe that an engineer who has done so much for tramways should now consider that an improved tramway may hold its own provided sufficient width is given to enable the cars to travel at a high rate of speed, independent of the general traffic? Does not this expression of opinion from so [illegible] authority show that the "tramway" of the future must in reality be a "light railway"?

* * * *

Is it not to be regretted that, although the reports of the Royal Commission on Sewage Disposal have been so valuable, their labours should cease when so many fields of investigation are still open for exploration? Would it not be an excellent idea for the Government to appoint a permanent commission in order that investigations and inquiries could be still further pressed into this important subject?

London and Lancashire Fire Insurance Company.—The directors of this company propose to pay, on the 1st proximo, a further dividend of 15s. per share, less income-tax, making, with the interim dividend of 14s. per share, less income-tax, paid last November, a total of 29s. per share, less income-tax, for the year 1914.

New Warrington Bridge.—The unveiling recently of a commemorative tablet affixed to the new ferro-concrete bridge over the Mersey at Warrington marked the completion of a structure which has taken three years to build and cost £23,370. The mayor, Alderman Peter Peacock, stated that the bridge was the second widest in Great Britain, and was only 2 ft. less than Westminster Bridge, London.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Boston T.C. (July 24th. Mr. R. H. Bicknell).—£3,600 for the erection of a refuse destructor. The borough surveyor, Mr. G. E. Clarke, stated that the proposed site for the destructor was the property of the town council, and consisted of 3 acres. The proposed destructor was one of the Meldrum type of three cells.

Naas U.D.C. (March 29th. Mr. A. P. Price).—A supplemental loan of £400 for the purpose of extending the sewerage system, and £200 for completing a building scheme for working-men's dwellings under the Housing of the Working Classes Act.—Evidence in support of the application was given by Mr. J. Boyle, town clerk, Mr. Hall, surveyor, Dr. Murphy, medical officer of health, and Messrs. Butterfield (chairman of the council), M. Fitzsimons and J. Dowling.

Ogmore and Garw U.D.C. (April 8th. Mr. A. W. Brightmore).—£19,997 for sewerage and sewage disposal works.—It was explained that the Ogmore and Garw Valleys were sewered years ago, and that the sewers discharged on a sewage farm at the bottom of the valleys, near Brynmenyn. Part of the loan was needed for the reconstruction of sewers at the top of the valleys, and part for the extension and improvement of the sewage disposal works. The sewers at the top of the valleys had been interfered with by colliery workings and by coal tipping. In some parts the sewers had been rendered absolutely useless, and the need of reconstruction was so urgent that the council had already carried out a portion of the work. This was a rapidly developing district, the population having increased by 50 per cent since 1891. Mr. Midgley Taylor, Westminster, gave details of the engineering features of the scheme.

Pontefract T.C. (March 31st. Mr. P. M. Crosthwaite).—£21,000 for works of sewage disposal.—A correspondent has favoured us with the following supplementary information with regard to the proposals outlined at this inquiry—an account of which was given in our last issue. The scheme consists in the provision of screening arrangements, followed by detritus tanks, after which the sewage is to be treated with alumino-ferric, and, passing down a mixing race, will be dealt with in four precipitation tanks with a total capacity of 360,000 gallons. The sewage is then to be dealt with on six percolating filters of 110 ft. diameter, and 6 ft. deep, the effluent from which will pass into three humus tanks, and have final treatment on four sand filters, the effluent being discharged into the Wash Dyke, near the Pontefract main road. It is intended to treat three times the dry-weather flow, or 1,800,000 gallons, as ordinary sewage, which will be taken off by floating weirs. The excess above this quantity and up to six times the dry-weather flow will be treated in storm-water tanks of 180,000 gallons capacity. During cleansing operations the top water in the tanks will be taken off by floating arms to a pump well, from which it will be raised to a receiving tank, and the contents allowed to flow slowly back to the mixing race, after which the sludge will be drawn off by sludge valves, and pumped to six sludge filters, the drainage and top water of which will also flow into the mixing race. Pumping plant for this purpose, consisting of oil engines and centrifugal pumps, will be installed. The engineers are Messrs. D. Balfour & Son, of London and Newcastle-on-Tyne, and the scheme is supported by the Rivers Board.

Seisdon R.D.C. (March 30th. Mr. M. K. North).—£900 for works of sewerage and sewage disposal.—It was explained that in March, 1912, the Local Government Board granted a loan of £7,500 in order that a good sewerage scheme might be culminated. It was embarked on under pressure from the Local Government Board and the County Council, and there was no doubt that it was absolutely necessary for it to be undertaken. Instead of the cost being £7,449, as was estimated, it had turned out to be £8,351. The reason for the great difference was that between the time the estimates were made and when the Local Government Board granted the loan there was a considerable rise in the prices of materials and labour. Another reason for the increased cost of the undertaking was that they had unexpected engineering difficulties, and there had been some useful extensions of the scheme.

APPLICATIONS FOR LOANS.

Leyton U.D.C.—£17,000 for additional electricity plant.

Nottingham T.C.—£40,304 for the Carter-gate and Manvers-street improvement scheme.

Pontefract T.C.—£1,100 for an automatic lighting scheme, and £269 for sewerage works.

Tottenham U.D.C.—£13,000 for a school for deaf and defective children.

West Ham T.C.—£3,000 for electricity mains.

Wigan T.C.—£6,000 for new boilers at the electricity works.

LOANS SANCTIONED.

Arklow U.D.C.—£1,400 for the erection of additional houses.

Barrow T.C.—£12,500 for electricity purposes.

Dalkey (Co. Dublin) U.D.C.—£10,500 for workmen's houses.

Dundalk R.D.C.—£10,370 for the erection of sixty-one houses.

Holywood U.D.C.—£5,750 for the water supply scheme (repayment in thirty years).

Manorhamilton R.D.C.—£3,060 for the erection of cottages.

FORTHCOMING INQUIRIES.

APRIL.	£
20.—**Axbridge.** For works of road improvement (Mr. W. O. E. Meade-King) ...	1,000
20.—**Malton.** For works of water supply (Mr. A. W. Brightmore)	820
21.—**Bolton.** For the purposes of the electricity undertaking (Mr. H. Shelford Bidwell)	45,032
21.—**Driffield.** For works of water supply (Mr. A. W. Brightmore)	180
21.—**Lutterworth.** For private street works (Mr. F. H. Tulloch)	255
22.—**Wombwell.** For the provision of public baths (Mr. A. W. Brightmore)	1,450
23.—**Gudworth.** For the purposes of the gasworks (Mr. A. W. Brightmore) ...	2,540
TOWN PLANNING.	
20.—**Croydon.** (Mr. George L. Pepler) ...	—
21.—**Nottingham.** (Mr. Raymond Unwin) ...	—
29.—**Little Hulton.** (Mr. Raymond Unwin)	—

Whitewashed Kerbs.—The Commissioner of Police is asking all the London local authorities to whiten the street kerbs during the present reduction of street lighting, the experiments that have been made in whitewashing of this kind having proved useful.

Bristol Tramways Purchase.—Mr. C. P. Sparks, the corporation's consulting electrical engineer, Mr. P. Addie, the city valuer, Mr. L. S. McKenzie, the city engineer, and Mr. Faraday Proctor, the city electrical engineer, have been instructed to value that portion of the Bristol tramways which is purchasable by the town under sec. 22 of the Tramways Act. The purchasable part includes 25 route miles out of a total of 31 route miles, and includes also the St. George and the Counterslip power stations and the depots of the company. It is reported that the total amount of their general valuation amounts to £610,981, the valuations being based on the present prices of material.

Road Wear by Railless Trolley Vehicles.—Bradford City Council some time ago appointed a sub-committee consisting of members representing the Streets, Drainage and Works, and Tramways Committees, to consider questions arising from the wear of roads on railless trolley vehicle routes. It is reported that this sub-committee has decided to recommend that some annual contribution, on a basis to be determined later, should be made by the Tramways Committee to the funds of the Street, Drainage and Works Committee, without prejudice to the position of either bodies concerned, in respect of the extra expenditure found to be necessary for the maintenance of roads on railless trolley vehicle routes in the city.

Municipal Work in Progress and Projected.

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The following are among the more important projected works of which particulars are given:—Building—Bath, Leyton, housing and town planning—Melton Mowbray, Swaffham [illegible] roads—Manchester, Middlesex, Wrexham sewerage and sewage disposal Bedale [illegible] and electricity—Filey, Riccall.—Particulars of other projected works will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Bath T.C.—The council are recommended by the Baths Committee to proceed with partial the [illegible] in connection with the Royal Baths and pump-room, at an estimated cost of £2,000 [illegible] £4,000 to be expended at once.

Bradford T.C.—The Health Committee recommend the town council to purchase a site for a small-pox hospital. The committee have also approved a scheme [illegible]

Cheltenham T.C.—The borough surveyor, Mr. J. S. Pickering, has prepared a scheme for the provision of radiant light and heat [illegible]

Leyton U.D.C.—The council have adopted a recommendation of the Fire Brigade Committee to build a temporary fire station on the council's land in Church-road, Leyton. The cost is estimated at £4,000 and £5,000, and it was stated that a certain amount of the work could be carried out by the [illegible]

New Forest R.D.C.—It was reported recently that Culverley new bridge had now been finished. The contractors (Messrs. Bright & Son) were liable for the bridge for six months after it was handed over. That time had expired, and the final test had been applied. The engineer, Mr. W. H. Masters, said that the contractors had made a most excellent job of the work. The bridge had been subject to a stringent test—two traction engines going over it abreast—and it was satisfactory. The total cost of the structure was £296.

Truro T.C.—The tender of Messrs. C. & J. Harris, of Truro, at £766, has been accepted for alterations to the municipal buildings.

West Riding C.C.—The county council has in the erection of the Bradley new schools specified the powder Pudlo for rough-casting the buildings. When Pudlo is included in the cement, rought-cast work is, we are assured, made quite impervious to driving rains.

HOUSING AND TOWN PLANNING.

Bideford R.D.C.—It was reported on Monday that the council had practically completed the erection of ten houses under Part II. of the Housing of the Working Classes Acts, loans for £2,346 having been obtained for the purpose. There was plenty of competition for the cottages, but the best rent that could be obtained by tender was 3s. 6d. per week inclusive. The scheme was not self-supporting, and it was probable there would be an annual charge of about £25 to the general district fund of the council, or about ¼d. in the £ calculated on the present assessable value.

Conway R.D.C.—The council have resolved to ask the councils in the rural area to consider the question of housing accommodation, and report to the council as to whether they were in favour of the council adopting the Housing Act of 1914. The surveyor, Mr. T. L. Oliver, in reporting upon the recent conference at Bangor on housing and town planning, referred particularly to the question of the width of the roads in rural areas, which has become important owing to the change in the mode of traffic. Living in the country was becoming more popular, and new property was being erected, so that the authorities of the rural districts should have power to see that wider roads should be provided for. New villages should be properly laid out under the control of the authority, and in each village a place for children to play in should be arranged for. So many motor cars and traction engines now passed along the roads that they were dangerous for children as playgrounds. Every village should have its village green.

Melton Mowbray R.D.C.—The Local Government Board have written that it appeared the council would find it difficult to deal adequately with existing conditions unless further working-class accommodation was provided, and as the board did not gather that private enterprise was likely to meet the need, they thought it would be necessary for the council themselves to provide some dwellings under Part III. of the Housing of the Working Classes Act, 1890. The council decided to ask permission to postpone further action, owing to the increased cost of building.

Swaffham U.D.C.—A letter has been received from the Local Government Board stating that they have had under consideration the report of their inspector, Mr. Leonard, after the inquiry held by him under the Housing and Town Planning Act, 1909, and they had come to the conclusion that further housing accommodation was necessary, and suggested that the council should submit definite proposals. If the council were prepared to take action at once they would be prepared to accept a proposal for the provision of eighteen houses.

Thedwastre R.D.C.—In reply to a question as to the progress made with the provision of houses, the clerk stated that the difficulty was to get the Local Government Board to state what their policy was. Inquiries had been held by the board in East Stow, and he had questioned the inspector as to getting the board to give a general expression of opinion as to whether local authorities could proceed with schemes involving capital expenditure during the war, and there had been a promise from the inspector that he would let him know. He was therefore allowing things to hang up a bit with regard to schemes not advanced.

PARKS AND OPEN SPACES.

Wallasey T.C.—The second bowling-green at the Oakdale recreation ground, Seacombe, was formally opened on Saturday last.

REFUSE COLLECTION AND DISPOSAL.

Guildford T.C.—The borough surveyor, Mr. E. Y. Harrison, submitted recently a report on the destructor. The consumption at the destructor for the last month, it was recorded, equalled 369¾ loads, against 486 loads in the corresponding period of 1914. The consumption of auxiliary fuel during the past month was as follows: Coal 33 tons 14 cwt., coke 17 tons 7 cwt., showing an increased consumption of 40 tons 2 cwt. During the corresponding period of 1913, 29 tons 3 cwt. were consumed. The increase in auxiliary fuel was undoubtedly due to the large decrease in the refuse collected. The refuse itself was of much less value as fuel on account of the special conditions now prevailing. Greater care had been exercised in stoking, and the refuse had been sufficient for generating the steam required during twenty hours of the day on five days in each of the last two weeks. The amount of rainfall recorded for the past month equalled 5·2 in.; for the corresponding period last year the rainfall was 3·52 in. The committee decided not to accept an offer to collect the bottles, crockery and old tins from the destructor on payment to the council of £20 per annum. It was explained by the chairman of the Sanitary Committee that as the committee were far from being satisfied with the continued increase in fuel consumption, the borough surveyor was paying visits to other destructors.

ROADS AND MATERIALS.

Berwickshire C.C.—The East District Committee have agreed to make a new departure in regard to tar-spraying by purchasing a large tar-boiler, and doing the spraying by direct labour.

Cardiganshire C.C.—Approval has been given to a scheme for tar-macadamising 2 miles of roads, at an estimated cost of £3,800, of which half will be contributed by the Road Board.

Claremorris R.D.C.—There is evidently great need for improved roads in the rural district, for it was stated by a councillor at the recent council meeting that "when the doctor and priest were summoned on sick calls at night, they risked their lives in trying to reach the people's houses." Another member in-

stanced villages which, he declared, were described as being "buried alive" for lack of road accommodation. Such picturesque metaphor may possibly present an exaggerated view of the position, but, be this as it may, the council have resolved to do everything in their power to meet the difficulty by deciding to pass all the urgent and necessary works, "wherever the money is to come from."

Clitheroe R.D.C.—Channelling and kerbing works are to be carried out in Mytton-road, at a cost of £430.

Dumbarton C.C.—At a meeting of the Western District Committee last week communications were read from Government departments suggesting the delay during the war of schemes involving capital expenditure, so that capital as well as labour might be made available in the direction in which they could best further the national interest at this time. Various road improvement schemes were accordingly delayed.

Essex C.C.—Repairs are to be carried out on the main road near Baddow Court, Great Baddow, at an estimated cost of £500. It has also been decided to reconstruct part of the road between the Ilford and Romford boundaries, at an estimated cost of £17,000.

Kensington B.C.—A proposition has been carried to plant trees in the central or northern section of Holland Park in the autumn.

Manchester T.C.—It is proposed to incur an expenditure of £39,700 in the purchase of property in Cross-street for a widening scheme.

Melksham U.D.C.—The tender of the Eagle Manufacturing Company, at £51 10s., has been accepted for the supply of a water cart to hold 400 gallons.

Merton U.D.C.—It has been agreed to employ a youth, at wages not exceeding 15s. a week, to check the receipts and issue of stores and tools at the depot. Replying to a suggestion that the road foreman could do the work, the chairman of the committee which submitted the proposal said the road foreman should be on the roads, and not doing boy's work at the stores.

Middlesex C.C.—The council are taking preliminary steps with regard to the construction of the Great West road, and have agreed to pay a further £13,500 compensation to freeholders and leaseholders in respect of land and property to be acquired.

Pickering U.D.C.—The surveyor, Mr. William I. Spink, has been instructed to obtain a supply of distilled tar in order to allow the disuse, at the request of the War Office through the Road Board, of crude tar, the by-products of which are largely used in the manufacture of high explosives. The surveyor stated that a good deal of crude tar had been used by the council on the roads and footpaths.

St. Germans R.D.C.—The surveyor, Mr. Harold Hockaday, has submitted an estimate, at £367, for remaking the road from Cross Park to the new military camp, Weard, St. Stephens, which the council have approved. The cost of the work will be borne by the military authorities.

Westhoughton U.D.C.—The council have submitted to the county council an estimate of £3,850 for the improvement of New Brook-road.

Woodbridge U.D.C.—It has been agreed to treat the roads this year with calcium chloride in place of tar.

SEWERAGE AND SEWAGE DISPOSAL.

Bedale R.D.C.—A scheme has been adopted for the extension of the sewage disposal works.

Belper R.D.C.—The surveyor, Mr. Robert C. Cordon, has been instructed to prepare a scheme for the drainage of Horsley Woodhouse, comprising new sewers and sewage disposal works. He has also received instructions to examine and report on the condition of the main sewers in the parish of Allestree, and to submit an estimate of the probable cost of taking up and relaying certain defective lengths.

Glasgow T.C.—An echo of the war and German piracy was suggested by a question asked at the recent council meeting if the war bonus granted the crews of the sludge steamers "Shieldhall" and "Dalmuir" was because of any risks of torpedoing which might be run. Bailie Kennedy explained that the boats had to enter what had been declared a war zone, and the increase granted was similar to that given by steamship companies to their employees under similar circumstances.

Halstead R.D.C.—It has been agreed to engage Messrs. Taylor & Wallin, Newcastle-on-Tyne, to prepare a preliminary plan for the disposal of the sewage of Castle Hedingham.

Magherafelt R.D.C.—The Local Government Board have sanctioned a scheme of sewerage for the district of Castledawson.

Stirlingshire C.C.—The Eastern District Committee have submitted to the county council a scheme for the improvement of the filter-beds at the Bonnybridge sewage disposal works, at an estimated cost of £650.

WATER, GAS, AND ELECTRICITY.

Filey U.D.C.—The extension of the pumping and boring plant, at an estimated cost of about £2,000, is under consideration.

Kingstown U.D.C.—Mr. J. P. Tierney, M.Inst.C.E., of Dublin, has been appointed consulting electrical engineer to the council, and instructed to prepare a scheme for the electric lighting of the district, and supervise the carrying out of the work, at a fee of 5 per cent.

Leeds T.C.—In view of the Treasury circular with respect to the expenditure of public money, the Waterworks Committee felt that, if possible, the great work on the Leighton dam might be suspended for twelve months at least. From the outset the scheme was undertaken more to provide for the future than to meet any immediate necessity, with, of course, the further consideration that if Leeds did not secure this valuable gathering ground some other town might step in and do so, leaving future generations of Leeds citizens to grapple with a serious difficulty. Now that the scheme for supplying Doncaster with the surplus water has been dropped there is even less need than there was for any hurry in the matter. An arrangement will, of course, have to be come to with the contractors, Messrs. Arnolds, who have still two years' work before them to complete their contract, but it is anticipated that no difficulty will arise.

Riccall R.D.C.—It was reported at the council meeting held recently that the Local Government Board had sanctioned the proposed loan from the Barlby water supply scheme.

Southgate U.D.C.—The surveyor, Mr. C. G. Lawson, has been instructed to endeavour to arrange, as an alternative to the present darkening of the upper portion of the street lamps, for one in every two or three lamps to be kept fully lighted, the remaining lamps not being lighted.

West Penwith R.D.C.—Acting upon the advice of the Local Government Board, the council have closed all the wells permanently, and the water supply has been supplemented. It was reported that other requirements with regard to sanitation were being considered.

MISCELLANEOUS.

East Molesey U.D.C.—The wages of the workmen have been increased by 2s. per week, as from March 6th last, for the continuance of the war.

Haddingtonshire C.C.—The council have refused to grant an increase of wages to roadmen who are physically fit and under thirty-eight years of age, but have given an increase to men over thirty-eight.

Newcastle (Ireland) U.D.C.—Attention was recently directed to the desirability of providing more adequate arrangements to cope with an outbreak of fire, and it was agreed that the surveyor, Mr. D. M. Gracey, should submit an estimate at the next meeting for erecting and furnishing with hose and stand-pipes two fire stations at the extreme ends of the town.

St. Thomas R.D.C.—The question who is responsible for clearing brooks was raised upon a report by the surveyor, Mr. J. Bray, that the silting up of Alphington brook had caused the flooding of two roads, doing serious damage and making the roads impassable. Mr. Maunder said it was a matter that should receive attention. The brook was still silting up, and as they had spent £40 or £50 upon the road already, it was serious. The council had always taken the view that it was the duty of landlords to clear brooks, but inasmuch as the council had jeopardised that position by paying in some cases, he doubted whether they could enforce it. The Earl of Devon had offered to clear out the Abington brook if the council would contribute £10 to the cost. The clerk, Mr. A. E. Ward, said he did not think the council could compel the landlord to do the work. Mr. Loram: Then why have we compelled others? The clerk: We have not compelled them. We have invited them to do so, and in many cases they have done so. Mr. Loram: Then where you have a soft compliance you let them pay. If we do this work now we must do it elsewhere.

Wrexham T.C.—A new motor fire engine, by Messrs. J. Morris & Sons, Salford, purchased by the council

for £1,000, was objected to a series of tests on Friday last at the corporation depot, Willow road.

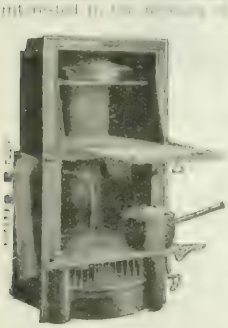
Surbiton U.D.C.—On the recommendations of the Drainage and Highways Committee respectively it was on Monday agreed to grant an increase for the period of the war, to all men engaged at the sewage disposal and refuse destruction works or on the highways, also to recently engaged men from 40s. per week.

Teddington U.D.C.—Mr. C. H. Parker, of Bath, has been appointed [illegible] for the [illegible] extensions at a salary of £[illegible] per week. The contract [illegible] Messrs. Mowlem & Co., Limited, to take payment for the new motor fire [illegible] by instalments—one-third on the [illegible], one-third twelve months after, and the balance at the end of a further twelve months, such payments to be without interest. By this concession it is estimated the council will save £264, the interest payable if a loan had been raised and repaid over ten years. The clerk, Mr. G. H. Salmons, said he had been informed that, though the Local Government Board would not formally sanction this arrangement, they would raise no objection.

Tiverton T.C.—The borough surveyor, Mr. J. Soldan, reported to the council on Monday that 20 per cent of the council employees enlisted on the outbreak of war, and that he had given a Local Government Board inspector the names of further men on the staff who could be spared if necessity arose, in which event all [illegible] would be provided.

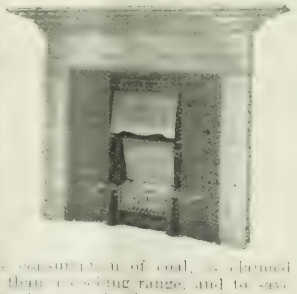
CONVERTIBLE STOVE FOR WORKMEN'S DWELLINGS.

In view of the [illegible] housing schemes being carried out by municipal authorities, it is an opportune moment to [illegible] surveyors and others interested in the working [illegible] the patent convertible stove known as the "Interoven." [illegible] to all that a cooking range is a veritable coal-eater. With it an enormous quantity of fuel is consumed in cooking a meal, and the greater part of the heat generated passes away up the chimney.



Briefly, the ordinary [illegible] the fire-[illegible] the sloping fire-back is lowered over the fire, closing it [illegible] and [illegible] [illegible] [illegible] and two [illegible] openings.

The cooking stove, the top [illegible] door, lets down, revealing an oven behind, and itself [illegible] The oven, which is [illegible] by 13 in. [illegible] 12 in. high, is capable of cooking a meal for eight or nine persons. The stove is fitted with a boiler which will heat a 30-gallon hot water tank, and can be easily fitted to any existing pipes.



This stove, in addition to being economical in its consumption of coal, is claimed to cost less to fit than a cooking range, and to save upwards of 20s. per house in brick work and labour. An important point for the tenant is that its use makes possible the conversion of a kitchen into a comfortable sitting-room.

The "Interoven" Stove Company, Limited, of 136 Charing Cross road, W.C., inform us that all engineers, architects, or others interested in housing schemes, will call upon them, they can see the "Interoven" stove in use, and will be given a practical demonstration of its value.

PERSONAL.

Mr. J. Ryan Pembroke, Co. Dublin, has been appointed county surveyor by the Queen's County Council.

Mr. W. J. Burgess, of Combemartin, has been appointed highway surveyor to the Launceston Rural District Council.

Mr. H. Hamer, assistant borough surveyor of Stockport, has been promoted to the position of deputy borough surveyor.

Mr. A. A. Goodall, surveyor to the Rhyl Urban District Council, has had his salary increased from £220 to £250 for one year.

Mr. W. J. Baker, assistant road foreman at Chelsea, has been appointed highways superintendent to the Watford Urban District Council.

Mr. C. F. Gettings, county surveyor of Worcestershire, has, pending the appointment of a successor to Mr. E. P. Hooley, been asked by the Notts County Council to advise them on certain matters.

Mr. R. M. Chart, sanitary surveyor to the Croydon Rural District Council, has had his salary increased for one month by £105 in consideration of his services in preparing a scheme for remodelling the council's sewage works.

Dr. W. Perrin Morris, chief medical officer, Medical Bureau, Commonwealth of Australia, will on Wednesday, April 28th, deliver before the members of the Royal Sanitary Institute a lecture on "The Evolution of Hygiene and Public Health in Australia." The Earl of Plymouth, president of the institute, will take the chair at 5 p.m.

Mr. W. Thompson, ASSOC.M.INST.C.E., deputy borough engineer and surveyor of Burton-on-Trent, was on Friday last appointed borough surveyor of Mansfield in succession to Mr. T. P. Collinge, who was recently chosen as borough surveyor of Rotherham. Mr. Thompson has been deputy at Burton-on-Trent since 1903, and previously he held appointments at Birkenhead and Newport (Mon.).

Mr. R. J. Whitley, engineer and surveyor to the Bentley-with-Arksey Urban District Council, has been congratulated [illegible] upon becoming an associate member of the Institution of Civil Engineers, the writer adding: "Mr. Whitley has been in Bentley since 1911, and has been responsible for many excellent improvements and additions, rendered necessary by the rapid increase in the population, which is now 13,000 as against 6,000 when he first came to the district."

Mr. Richard P. Hirst, ASSOC.M.INST.C.E., has retired from the position of consulting engineer to the Southport Corporation. Mr. Hirst was appointed assistant surveyor to the Corporation of Southport in June, 1881, out of upwards of 100 candidates. He acted as deputy surveyor to the late Mr. Crabtree, and was acting surveyor during his long illness. In February, 1896, he was formally appointed borough engineer and surveyor by the corporation, from which position, owing to a breakdown in health, he retired in March, 1912, when he was appointed consulting engineer for a period of three years.

Mr. James Snook, highways superintendent and farm manager to the Wimbledon Corporation, died, we regret to state on Sunday morning from pneumonia, after five days' illness. Mr. Snook had been in the service of this district for thirty-six years, having been appointed sewage farm manager by the late Wimbledon Local Board in 1879, at a time when the sewage works and farm were a constant source of trouble to those who lived near, as well as to the local board. Mr. Snook was brought up on the Beddington and Norwood Farms under his father, Mr. James Snook, who was then farm manager to the Croydon Corporation, and afterwards to the Northampton Corporation. No one possessed a more thorough knowledge of irrigation and the preparation of ground than Mr. James Snook, senior, who previous to being engaged on sewage treatment worked on irrigation meadows in Wiltshire. Mr. Snook subsequently laid out various sewage works and farms for Mr. Baldwin Latham, M.INST.C.E. When the Court of Chancery put the Merthyr Tydfil sewage works in the hands of Mr. Bailey Denton, M.INST.C.E., that gentleman placed the management of these works in the hands of Mr. Snook. Previous to his appointment at Wimbledon he was engaged with the late Mr. W. Santo Crimp in laying out the Merton

sewage works and the sewers connected therewith, for Mr. Baldwin Latham. It was not long after Mr. Snook had charge of the Wimbledon sewage farm and works that these undertakings proved so efficient that they received the attention of authorities from all parts, especially as Wimbledon was one of the few places where sewage was treated successfully on clay ground. The sewage works of Merton and Surbiton are in charge of his sons, Henry and Charles Austin. During the time Mr. Snook has been in Wimbledon the population has increased from 13,000 to 59,000, while the length of roads repaired by the local authority has increased from 4 miles to 48½ miles.

Mr. T. P. Frank, borough surveyor of Newark, was on Friday appointed borough surveyor of Stockton in succession to the late Mr. M. H. Sykes, at a salary of £500, rising to £700. From 1899 to 1903 Mr. Frank was engaged in the Huddersfield borough surveyor's department, three years of this time being spent as an articled pupil. In 1903 he was appointed deputy borough surveyor and water engineer of Dewsbury. While holding this office he gave (in 1905) a course of lectures at the Leeds University on "Geodesy," and was also lecturer on "Civil and Municipal Engineering" at the Leeds Central Technical School (1907-8). In 1908 he became city surveyor of Ripon, and from 1912 to the present time he has held the office of borough surveyor and water engineer to the corporation of Newark-on-Trent. It may be noted that Mr. Frank was on the short list for the Mansfield borough engineer and surveyorship, and

Mr. T. P. Frank,
Borough Surveyor of Stockton.

was invited to attend there at the same time as he was asked to appear at Stockton. He is a Fellow of the Surveyors' Institution, associate-member of the Institution of Civil Engineers, a member of the Institution of Municipal and County Engineers, and of the Royal Sanitary Institute, and an associate-member of the Institution of Water Engineers.

Mr. F. W. Bricknell was last week formally appointed, at a salary of £750 a year, city engineer of Hull in succession to Mr. A. E. White, retired. Alderman Larard, who proposed the appointment, paid a high compliment to Mr. Bricknell's ability. For five years he had practically had charge of the city engineer's department. Mr. Bricknell is a native of Leamington, and received his education at Trent College. In 1877 he was articled to Mr. J. Fox Sharp, M.Inst.C.E., then borough engineer of Hull. He was transferred to the salaried staff in 1880, and received promotion from time to time. On the retirement of Mr. Fox Sharp in 1887, and the consequent promotion of Mr. A. E. White, he took Mr. White's place as assistant borough engineer. Hull, it may be stated in passing, had been considered rather a squalid and badly equipped town, but had already made some headway when, about 1898, a progressive movement set in, led by Alderman Larard, who dealt with the purchase and reconstruction of the tramways, and Sir Alfred Gelder, who initiated the wholesale street improvements which were carried out concurrently with the reconstruction of the tramways during the following years. Mr. Bricknell has been engaged in some capacity on most of the important works which were carried out during Mr. White's tenure of office, and latterly was virtually responsible for several sections of the work, including town planning, parks, baths and markets matters, and the reorganisation and equipment of the works department for carrying out scavenging and cartage by direct labour. He has specialised in parks and baths, and was mainly responsible for the three fine sets of baths which the corporation possesses, and for the Pickering Park. He has been an associate-member of the Institution of Civil Engineers since 1886.

A correspondent who is intimately acquainted with the municipal work of Hull writes: "You will be aware that the whole of the main roads in Hull and most of the streets in the centre of the city are paved with wood, and we are very proud of the cleanliness and good condition of our streets. With the laying of the wood paving boys were engaged for street-orderly work, and now number seventy, and since 1902 Mr. Bricknell has been the chairman of a committee for organising these

Mr. F. W. Bricknell,
City Engineer of Hull.

boys on Boys' Brigade lines. The chairman of the Works Committee, Alderman Larard, has very heartily supported Mr. Bricknell in everything for the good of the lads, and the result has been an organisation which has helped to develop manliness and robust character among a class of boys who were greatly in need of care and attention, and who, especially in later years, were chosen because of their poor circumstances and their social disadvantages. Mr. Bricknell never misses the drill night or the Friendly Society, and has given freely of his time, energy and money, and has never flagged in his interest during the whole of the thirteen years he has kept the work going. At the present time a very large number of boys who have been trained by the club are in the Army or Navy, and a good number of them have attained to non-commissioned rank."

OBITUARY.

We deeply regret to have to record the death of Mr. Josiah Smart, senr., senior partner in the well-known firm of Josiah Smart & Son, of London, Matlock, Walsall, and Kettering. Mr. Smart rose to prominence in the business world from small beginnings. Forty-five years ago he went to Hitchin to carry out certain tar-paving work for the Great Northern Railway. He removed to Stevenage some four or five years later, and in 1883 commenced in business for himself as a tar-paving contractor, and, subsequently, as a sand and gravel merchant. He was one of the pioneers of tar macadam paving for roadways, and the firm of which he was the head owes not a little of its prosperity to the special attention which in recent years he gave to the production of that material. Mr. Smart was born at Nottingham in 1836.

Road Work and Military Traffic.—In order that there shall be no interference with military traffic the War Office is asking local authorities to postpone road repairs until the work can be commenced without prejudice to military requirements. On this account the London County Council tramway work at Eltham is to be suspended.

Institution of Municipal and County Engineers.

EAST MIDLAND DISTRICT MEETING AT LOUGHBOROUGH.

A meeting of the East Midland District of the Institution of Municipal and County Engineers was held at Loughborough Town Hall on Saturday last. There was a large attendance of members and visitors, the company including Messrs. L. L. Baldwin (Coalville), P. Bunn (Lichfield), E. W. Burn (Saltburn-by-the-Sea), W. G. Clarke (Wigston), H. G. Cooke (Market Harborough), E. A. Cope (Derby), E. H. Crump (Hinckley), hon. district secretary, W. H. Cust (Leicester), F. P. Cook (Mansfield Woodhouse), F. S. Coburn (Leicester), H. Coleby (Atherstone), S. Douglas (Kenilworth), A. H. Elliott (Carlton), T. W. Gordon (Nottingham), G. H. Hawley (Bastford), J. W. Horton (Derby), F. W. Mann (Leicester), S. Mayo (Basford), E. C. Moorhouse (Melton Mowbray), A. Parker (Oakham), A. J. Rose (Ludlow), P. M. Smith (Leicester), S. Turner (Ashby-de-la-Zouch), A. H. Walker (Loughborough), W. S. Woodcock (Oakham), and E. Wheeler (Eastwood), members; T. Aucott (Hinckley), A. Delkes (Leicester), S. Easey (Leicester), W. Granger (Loughborough), W. Jenkinson (Hinckley), D. Lansdoun (Hinckley), W. Keay (Leicester), G. Moore (Leicester), F. W. Prentice (Loughborough), L. Straw (Carlton), J. Scholes (Leicester), J. Tyron (Leicester), W. Walker (Nuneaton), and T. Wood (Leicester), visitors.

The district chairman, Mr. E. G. Mawbey, of Leicester, was unfortunately unable to be present, being confined to his room by a severe cold, and the chair was therefore taken by Mr. H. G. Cooke, of Market Harborough.

The minutes of the previous meeting at Hinckley having been read and signed, the district secretary explained that it had been his intention to have had the Loughborough meeting earlier in order that the members might have had the opportunity of discussing nominations for the various district offices. This, however, had been found impracticable; therefore the nominations—the ballot papers of which had not been sent out before the meeting—had been made by individual members. Consequently the only district business to transact was the election of a district committee.

ELECTION OF DISTRICT COMMITTEE.

The meeting then proceeded to elect the committee, and the following gentlemen were appointed for the respective counties in the district:—

Nottinghamshire.—Messrs. F. P. Cook (Mansfield Woodhouse), T. Henry (Retford), and T. Gunter (Nottingham).

Leicestershire.—Messrs. A. H. Walker (Loughborough), A. Rose (Ludlow), and W. H. Cust (Leicester).

Lincolnshire.—Messrs. H. G. Whyatt (Grimsby), W. B. Purser (Kesteven), and T. Lake (Bourne).

Derbyshire.—Messrs. J. H. Horton (Derby), V. Smith (Chesterfield), and E. A. Clews (Derby).

The district secretary reported that he had received letters of apology for absence from Messrs. Measures (Leicester), Purser (Kesteven), Henry (Retford), Jeeves (Melton Mowbray), Ryman (Stamford), Frank (Newark), and Penn (Belper), among others.

On the proposition of the chairman a hearty vote of thanks was accorded to his Worship the Mayor and the Corporation of Loughborough for the use of the town hall for the meeting.

The members and visitors proceeded to the public baths, where a demonstration was given of a self-instructing swimming apparatus made by Messrs. Herbert Morris, Limited, of Loughborough, and a representative of this firm thoroughly explained and gave all details in connection with the apparatus.

LOUGHBOROUGH SEWAGE WORKS.

The party then drove to the sewage farm and outfall works, and here a full description of the works was given by the borough engineer, Mr. A. H. Walker, Assoc.M.Inst.C.E., previous to the inspection of the works, which include pumping station, refuse destructor of Messrs. Manlove & Elliott's type—the steam from which is used to pump the sewage—Dortmund tanks and experimental percolating filter-bed made of clinker from the destructor.

Briefly, the treatment of the sewage is as follows:—The sewage is delivered into a pump well at the farm, and thence it is lifted by means of centrifugal pumps into the Dortmund tanks, from which it proceeds on the farm. It then passes into grips, and this method of distribution of the sewage was favourably commented upon by the members. The greater portion of the farm strata is of excellent gravel, and the [illegible] at a depth of about 3 ft. the effluent being collected and passed into the river Soar.

The [illegible] was inspected by the members appeared to be very satisfactory indeed.

The [illegible] Corporation are to be congratulated on having an excellent gravel bed on their farm. A small portion of the farm is of a clayey nature, and, in order to facilitate the treatment of sewage on this, a thickness of destructor clinker was added some years ago, and seems to have had the desired effect.

The percolating bed is of destructor clinker, of [illegible] and the sewage is applied [illegible] Many questions were asked concerning the works, and all required information was readily given by the borough engineer and his staff. The general verdict appeared to be that the farm and works were excellently managed, and that, given a good gravelly subsoil, sewage could be successfully treated by [illegible]

The [illegible] the town hall, where, by the hospitality of Mr. and Mrs. Walker, they were entertained to tea. On the [illegible] of Coalville, a hearty vote of thanks was passed to Mr. and Mrs. Walker for their kindness, and the [illegible]

EASTERN DISTRICT MEETING AT WESTMINSTER.

[illegible] in The Surveyor of March 19th], was concluded on [illegible]—Messrs. E. Willis (Chiswick), A. E. Collins (Norwich), Reginald Brown (Southall-Norwood), W. Gornall (Hendon Rural), D. S. Sutherland (Southgate), H. F. Wilkinson (Tottenham), and J. A. Webb (Hendon Rural), hon. district secretary—put in an appearance, and a quarter of an hour sufficed for the debate to exhaust itself, after which a private discussion ensued on the question of motor traffic. Mr. Reginald Brown was voted to the chair in the absence of the district chairman, Mr. H. T. Wakelam.

At the outset a letter from Mr. Willis on the subject of tarred clinker—commented upon by him at the [illegible] last—was read. In this Mr. Willis said he found the approximate proportions employed in the manufacture of clinker tar-macadam in Chiswick, expressed per cubic yard, were from 9½ to 10 gallons of tar, 39 lb. of pitch, and 26 lb. of blue lias lime. These varied slightly, according to the method of mixing. If the clinker was crushed while [illegible] at once, the tar mixture gave a much better product. Similarly, in hot summer weather the result was more satisfactory. The economy at the works was estimated [illegible] to 1s. per cubic yard upon the above figures, under no-t favourable circumstances.

Mr. Wilkinson stated that in his district they had been putting down concrete on one and two-coat work with foundations of two or three different kinds. In one area two-coat work had been put down in the [illegible] garage, and he was watching the effect of the grinding of the motor 'bus wheels on the road. In regard to the materials used for foundations, he was inclined to think that clinker formed the most resilient foundation. The use of a 7-ton roller for the work had been found to give more satisfactory results than the use of a 10-ton roller, while he had found that petrol was a very destructive agent when it had anything to do with asphalt macadam.

Mr. Brown expressed himself in favour of grading the material for road purposes, believing that the nearer one got the material wholly composed of the wearing material itself, with the least quantity of cementing material, the better the result would be.

In view of what had been said about clinker roads he thought they were really reducing road making to an absurdity. They first of all made up their minds that granite was the only material fit for ordinary roads, water-bound roads, and now they had come to find that clinker was good for certain roads if it were mixed with tar. If tar was going to make all the difference it was about time, he thought, that they, as engineers, started *ab initio* to ascertain what was the best material according to the varying traffic to which the roads would be subjected. If clinker was such an excellent material, why should they go to the expense of 10s. or 12s. a ton for tarred slag, or 18s. or 19s. for granite? The whole thing seemed to lead to the subject of the wearing qualities of tar, which took all the strain instead of the material itself.

Mr. Willis said he had used tarred clinker under 1-in. wearing carpet, and had found it to be the same as when it was put down.

Mr. Webb said he had experimented with various kinds of materials, but the best thing, the most economical and the most lasting, so far as his district was concerned, was ordinary Leicestershire granite, or Clee Hill granite, mixed with Tarvia and laid about 2½in. thick over the road. In some cases he had scarified the road; in others he had filled up the low places before putting on the material. He had subsequently covered it with a thin layer of ¼ in. or ⅜ in. granite chippings, mixed with Tarvia, and then in the summer or spring, when the road was surface-tarred, there was an excellent surface, the voids in the road being very few. He regarded Plascom as a very excellent thing, and had seen some very good results when it had been properly laid; but on a clay soil he did not advocate anything unless it had elastic qualities.

Mr. Collins expressed the opinion that the discussion had been of more practical value than ninety-nine out of a hundred set papers, and he would be glad to see the principle extended.

ARMY SANITATION.

LOCAL AUTHORITIES' GOOD WORK.

The Local Government Board have received from the Army Council a letter in which deep appreciation is expressed of the assistance which local public health authorities, under the guidance of the board, have rendered since the outbreak of war to troops stationed in their administrative areas. The Army Council state that this assistance in the unexampled circumstances of the last eight months has been invaluable in safeguarding the health of the forces, and in preventing the spread of infectious disease to an extent which would have been otherwise impracticable, and the Council are asked to convey to the councils of the counties, boroughs and sanitary districts concerned the thanks of the Army Council for the work thus undertaken. In particular reference is made to the valuable services which have been given by medical officers of health, sanitary inspectors and other officials of the local authorities in co-operating with the army sanitary service.

The Army Council trust that during the coming summer months they may continue to secure the assistance, advice and co-operation of these authorities and their expert officers, under the general supervision of the board's medical inspectors, with a view to maintaining the present favourable record as to disease among troops stationed in camps and billets in the United Kingdom.

Royal Society of Arts.—A paper on "Utilisation of Solar Energy" will be read by Mr. A. S. E. Ackermann, B.SC.(ENG.), ASSOC.M.INST.C.E., at the Royal Society of Arts, John-street, Adelphi, on Wednesday, April 28th, at 8 p.m. This paper will supplement that given before the Society of Engineers in April, 1914, by dealing with the experiments of other workers in the field.

Business Announcement.—Messrs. Summerscales, Limited, Keighley, announce that they have completed the purchase of the goodwill, drawings, patterns, models and all business matters in connection with "Cundall" engines, gas, petrol, oil, spirit and producers, &c. They are removing these to their works at Phœnix Foundry, and purpose manufacturing these engines and gas plants.

DUST PREVENTION.*

By Major W. W Crosby,
Consulting Engineer, Baltimore, Maryland.

General agreement among highway authorities has developed the fact that dust proceeds not only from attrition of the roadway surface by hard tyres and the feet of animals, but also comes from the grinding on each other of fine pieces of aggregate or road metal forming the pavement or crust. This internal wear of the surfacing is much greater than was formerly suspected, and it largely accounts, in many cases, for the layer of mud and dust to be found on macadam, for instance, even when freely removed from the surface at frequent intervals by scraping or sweeping.

The amount of the internally produced mud seems to bear a relation to the weight of the traffic, and to the moisture present—such as results from sprinkling with water—as well as to the friability of the stone used and to the methods of construction.

Heavy vehicles, even when shod with rubber tyres, set up severe strains in the road crust, and tend to make the particles of stone in macadam rub against each other in resisting these strains. If water is present in excess in the mass at the same time the stones wear into mud more easily. Soft materials, of course, produce more fine material than harder ones under the same conditions. If the particles of material composing the macadam are closely knit and mechanically or physically bound together by their angular shapes, they naturally move less under the strains, and the rubbing and consequent fine material produced is less in amount.

Real dust prevention, it will be seen, begins, therefore, with the construction of the road crust. In this work it will be necessary to avoid, as far as practicable, the subsequent production of both superficial and internal dust, which latter rises eventually to the surface, and becomes appreciable externally—selecting road metal of the most appropriate hardness considering the traffic, by providing thorough proper drainage against the continued presence of an excess of water in the road crust, and by securing the firmest angular bond that the metal is capable of in the macadam.

EXCESS OF FINE MATERIAL.

It has been found that, even where good road metal was used, and under light traffic, road crusts built with the use of an excess of fine material in their first construction have proved to be subsequently more dusty under the same conditions than where the fine material used was kept to a minimum. Evidently the excess of fine material, not only from its presence easily furnished more dust to be raised, but also it prevented the closest interlocking of the coarser particles. This resulted in an increased movement of them under strains on the surface, and therefore the production of more internal dust. The dustiest kind of a stoned roadway is an old turnpike, where the stones were liberally mixed with earth in order to help their compaction under traffic, and where they are bedded, like plums in a pudding, in a matrix of fine material.

With modern machinery and the construction of the macadam by sufficient rolling, the use of fine material should always be kept as low as possible. It will have to be used, to some extent, for filling the voids between the coarser particles; but even then a selection for the finer particles should be made, and, as far as practicable, that chosen should be highly resistant to the tendencies toward its reduction to dust. It will pay in using limestone to use at least 50 per cent of the fine material required for bonding the macadam of clean sand such as would be suitable for mortar. In many cases all the fine material necessary may profitably be such sand even when used with crushed trap rock, and with shells no fine material, except such sand, should ever be used. In no case are the best results ever obtained by the use of clay, silt or loam for binding macadam. A further reduction in the quantity of fine material used in filling the voids of macadam is possible by the use of bituminous material for this purpose, and this "pitch" has also another effect referred to later.

No matter how built, a roadway, even in city streets, may become superficially dusty, and the suppression of the dust on its surface from becoming objectionable may be desirable. Frequent cleaning or removal of

* Paper presented at second International Good Roads Convention at Toronto on March 24th.

the dust with the dirt may solve the problem, or it may be unpracticable to that extent, and other means of relief may be necessary.

WATER AS A DUST LAYER.

The simplest of these is sprinkling with water to "lay the dust." The objections to this are that it is seldom done efficiently, because it has to be done periodically, and between the times of sprinkling, when a temporary excess of water is applied, the surface condition varies from muddy to dusty again; further, the cost of sprinkling with water may not be economical if that is the sole reliance for the suppression of the dust. Proper cleaning, with sprinkling or washing of the street surface, may, under some city conditions, be satisfactory.

Efforts have been made to increase the effectiveness of water sprinkling by the use of sea water, which contains hygroscopic salts, or by the addition of such salts as calcium chloride to the water. Under some conditions the results have seemed to be successful to a certain extent. These salts absorb moisture from the air, and tend to keep the roadway surface moist enough to hold down the dust even after the water originally applied with them would otherwise have disappeared and failed to do this. Their effect, however, is not permanent, nor is it powerful enough to meet severe conditions of traffic tending to produce or raise dust; further, these salts are soluble, and are washed away to the gutters and water-courses by rain. Their re-application becomes necessary at intervals more or less frequent according to local conditions.

The salt (calcium chloride) itself has been used on the same principles by being spread in a finely divided and dry state over the roadway surface. In this way the effects of it are, perhaps, stronger, and more noticeable or lasting.

GLUTRIN.

Another what might be called "chemical" process consists of the use of concentrated sulphite liquor usually produced as a waste or by-product at wood-pulp mills, and commercially known as Glutrin. The Glutrin is used either with or without the addition of water. The effects of the Glutrin are composite. It has some cementing powers, such as exists with sugar. It also, through its tannic acid content, has a chemical effect on some of the materials composing the road crust, which tends, perhaps, to strengthen their normal binding power. For instance, it may make a clay much more plastic and tenacious; further, road surfaces treated with Glutrin seem to "set up harder, and, to some extent, to resist abrasion better.

The Glutrin is, however, more or less soluble in water, and eventually will be washed out of the road crust, even if the impregnation is fairly deep, as subsequent wetting of the crust brings the Glutrin gradually to the surface. Under some conditions the use of Glutrin as a dust preventive has been fairly successful.

BITUMINOUS MATERIALS.

The most successful of the materials used for either the prevention or suppression of dust on roadways are the bituminous materials, and they can generally be used for both purposes.

If the voids in the road metal are, for instance, filled with bituminous material, the internal production of dust is prevented. The external production of dust even may also be reduced because of the cushioning effect of the pitchy matrix and the greater resiliency, thus given the piece of road metal subjected to the shock or attrition of traffic. If the bituminous material is only applied to the surface of the road crust, it still reduces the dust nuisance by suppressing the raising of the dust underneath or mixed with it, and in many cases by protecting the road metal from any superficial wear from traffic.

Further, a proper bituminous material possesses to a large degree, and greater than in the cases of other materials, the ability to absorb a considerable amount of dust produced elsewhere, and, perhaps, brought on to the roadway through various agencies. This is important from the economic point of view.

What is a "proper" bituminous material will depend so largely, in any case, upon the local conditions that no close definitions can be given in this paper. Perhaps it might be said that, generally speaking, the asphaltic oils are better for this work than the paraffin base oils, that a good bituminous dust layer will give benefits other than the mere reduction of dustiness on the roadway—such, for instance, as the reduction of noisiness and an increase in sanitariness—and that usually its proper application will be in the interests of both economy and general satisfaction.

On the other hand, the improper use of an unsuitable bituminous material will produce results on the roadway second to none as far as nastiness and general dissatisfaction are concerned.

Roads Improvement Association.—The twenty-eighth annual general meeting of the Roads Improvement Association will be held at the Institution of Civil Engineers, Westminster, London, S.W., on Thursday, April 22, 1915, at 4 p.m. precisely. In the absence of the president, H.R.H. Prince Arthur of Connaught, who is on active service, the chair will be occupied by the Hon. Arthur Stanley, M.V.O., M.P.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President Mr J. S. PICKERING, M.INST.C.E., Borough Surveyor and Water Engineer, Cheltenham.

METROPOLITAN DISTRICT MEETING.

At a Metropolitan District meeting to be held at 92 Victoria-street, Westminster, on April 30th, at 7.30 p.m., a discussion will take place on "The Heavy Traffic Problems of London."

Members in Greater London are specially invited.

SCARBOROUGH MEETING.

An institution meeting will be held in the North-Eastern District at Scarborough on Saturday, May 8th.

PROGRAMME.

10 a.m.—Assemble at the town hall.

10.15 a.m.—Reception by his Worship the Mayor (Mr. C. C. Graham). A paper entitled "Catering for the Wants of the Holiday-maker," by Mr. Harry W. Smith, ASSOC.M.INST.C.E., borough engineer and surveyor, will be taken as read. Any discussion thereon may take place at the close of the meeting after the various works have been inspected.

10.15 a.m.—Inspection of Spa improvements, beach bungalows, South Cliff Gardens, bathing pool, &c., in the South Bay.

1 p.m.—Lunch at the Grand Hotel. (Tickets, 3s. each.)

2 p.m.—Meeting of the members of the North-Eastern District to consider—

(*a*) The report of the Executive Committee as to the desirability of reporting the proceedings of district meetings in the Press.

(*b*) Any other business.

2.30 p.m.—Leave the Grand Hotel by char-à-banc (tickets 2s. each) for the Castle Hill, to view the damage caused by the bombardment on December 16, 1914, by the German battleships, and to inspect the Keep.

3.15 p.m.—Leave the Castle Hill, and inspect the Alexandra Gardens, Floral Hall, Peasholm Park, and the beach bungalows and bathing establishment in the North Bay.

4.30 p.m.—Leave the north end of the Royal Albert-drive by motor char-à-banc for drive along the Marine-drive, Valley Park, to the Mere.

5.15 p.m.—Afternoon tea at the town hall by the kind invitation of his Worship the Mayor (Mr. C. C. Graham).

AYR MEETING.

At the Scottish District annual meeting to be held at Ayr on June 2nd and 3rd, papers on town planning, municipal housing, road work, and scraping of water mains will be submitted.

On the first day visits will be paid to the municipal works of the town, and the following day will be devoted to inspections of experimental road stretches in Ayr County, and Hillhouse Quarry, and to a visit to Loch Doon.

MATLOCK MEETING.

The arrangements for the institution meeting to be held at Matlock on June 12th include visits to the new sewage works, the Lime and electric baths, and other undertakings.

J. W. DUDLEY ROBINSON,
Secretary

92 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. W. H. Matthews Jones, City Engineer and Surveyor, Chester.

NORTH-EASTERN AND EASTERN DISTRICTS.

A meeting of the North-Eastern and Eastern Districts of the institution will be held at Newark-on-Trent on Saturday, April 24th.

1.45 p.m.—Meet at the Saracen's Head Hotel, and proceed to the town hall.

2 p.m.—Welcome at the town hall by his Worship the Mayor, Mr. J. C. Kew.

2.30 p.m.—Proceed to inspection of old castle ruins. En route Ossington Coffee Palace, Trent Bridge and free library will be pointed out.
Parish church (exterior and interior). A short organ recital will be given by Mr. W. F. Wright, A.R.C.O., organist.
Old Magnus Buildings, with Tudor Hall, recently restored at a cost of £2,000 by Mr. H. W. Lockton, M.S.A. (member).
Various old buildings in Market-place.
Beaumond Cross.
New Magnus Grammar School (by the kindness of the Rev. H. Gorse, M.A., head master), designed by Mr. Lockton, and carried out at a cost of over £10,000.

5 p.m.—High tea at the Saracen's Head Hotel, at a cost of 2s. 6d. per head.
Short descriptive notes of the visits will be given by Mr. Lockton, and by Mr. P. A. Watford (member), surveyor, Claypole Rural District Council.

Members of the Yorkshire and other districts are invited to attend.

G. Belson Chilvers,
Hon. District Secretary.

Oundle, Northants.

SOUTHERN AND SOUTH-EASTERN DISTRICTS.

A visit will be paid on Saturday, April 24th, to the New County Hall Works of the London County Council.

Members will meet on the site of the works, Belvedere-road, Westminster Bridge, at 2.30.

The contract now in progress embraces roughly some three-fourths of the complete building (the northern blocks being not yet commenced), and the bulk of the work is at about second floor level.

Members contemplating attendance are requested to send me a card.

Arthur Palmer,
Hon. District Secretary.

Town Hall,
Greenwich.

Glendevon Water Supply Scheme.—The Dunfermline District Committee have let the contract for the construction of the new reservoir at Glendevon to Messrs. P. & W. Anderson, of Glasgow. The contract price for the work, which also includes the formation of a road of access and the erection of the necessary fencing, is £97,000.

Oldham Destructor Works Extensions. The members of the Oldham Corporation Surveyor's and Buildings Committee inspected recently the extensions effected at the Rhodes Bank destructor works, which have been completed. Some time ago the committee decided to erect four new destructor cells, with a view to preventing the tipping of refuse on tips, and to meet the increased collection in the central district of the borough; also to enable the destructor flues to be more frequently cleaned owing to the dusty nature of the refuse collected from ash cans. These cells are now completed, and working satisfactorily. The destructor is on the latest Horsfall patent system, and comprises four back-feed cells, having a total capacity of 50 tons per day, Lancashire boiler, dust catcher, and flues connected to the old electricity works chimney, together with forced-draught apparatus and steam engine installed in the basement under the destructor. The whole of the ironwork and machinery for the cells were obtained from the New Destructor Company, Limited, who are the present owners of the Horsfall concern. The brickwork of the furnace, flues and boiler setting, and the construction of the buildings has been carried out by the borough surveyor's department, the contractor being Mr. Edward Stephenson, Union-street West, Oldham.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ASSISTANT SURVEYOR.—April 16th. Wellingborough Urban District Council. £120 per annum. Mr. J. T. Parker, clerk, 29 Church-street, Wellingborough.

ROAD FOREMAN.—April 17th. Earby Urban District Council. 30s. per week.—Mr. J. E. Aldersley, surveyor.

SEWAGE WORKS MANAGER.—April 22nd. Hailsham Rural District Council. 35s. per week.—Mr. Edmund Catt, clerk, 17 London-road, Hailsham.

SURVEYOR'S TEMPORARY ASSISTANT.—April 23rd.—Corporation of Salisbury. £150 per annum.—Mr. Francis Hodding, town clerk.

INSPECTOR OF NUISANCES.—April 26th.—Romford Rural District Council. £130—£150 per annum.—Mr. T. W. A. Greenhalgh, clerk.

ASSISTANT ROAD FOREMAN.—April 30th.—Corporation of Ealing. 42s. per week.—Mr. W. R. Hicks, borough engineer and surveyor.

ASSISTANT ENGINEER.—May 1st. Colombo Municipal Council. Rs.4,500/- per annum, with a committed allowance of Rs. 900/- per annum. Mr. R. Eustace Tickell, Institution of Civil Engineers, Great George-street, Westminster, London, S.W.

ASSISTANT IN BOROUGH SURVEYOR'S OFFICE.—April 17th.—Corporation of Dorchester.—Mr. H. D. Strange, borough surveyor, North-square, Dorchester.

CLERK OF WORKS.—Tyldesley Urban District Council. £2 10s. per week.—Mr. Francis E. Jones, engineer and surveyor, Council Offices, Tyldesley.

MUNICIPAL COMPETITIONS OPEN.

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WHITEHAVEN.—April 21st.—Competitive designs for laying out the coach road site (6 acres 1 rood 25 poles) and the erection of houses, for the town council. Premiums, 30, 20 and 10 guineas.—Mr. T. Brown, town clerk.

GALEMIRE.—Designs for a small hospital, for the Galemire (Whitehaven) Joint Hospital Committee.—Mr. E. B. Croasdell, clerk, Union Hall, Whitehaven.

LOUTH.—Designs for new county offices to be erected at Dundalk, for the Louth County Council. Prof. William A. Scott, A.R.I.B.A., has been appointed assessor.—Mr. C. McAlister, county secretary, Court House, Dundalk.

STEPNEY.—Designs for municipal buildings, for the borough council. Mr. H. T. Hare, F.R.I.B.A., has been appointed assessor.—Mr. G. W. Clarke, town clerk, 15 Great Alie-street, Whitechapel.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

HALIFAX.—April 17th.—For the erection of a tramway waiting-room and tool-house, for the corporation.—Mr. J. Lord, borough engineer and surveyor.

CHESTERFIELD.—April 19th.—For laying and jointing cast-iron water mains, for the rural district council.—Mr. G. Frith, waterworks engineer, Council Offices.

DURHAM.—April 19th.—For the rebuilding of a bridge, for the county council.—County Surveyor, Shire Hall, Durham.

EAST RIDING.—April 19th.—For laying out the site and for the erection of buildings in connection with the Great Driffield hospital, for the Hospital

Committee.—Mr. E. E. Stanford, [illegible] veyor, County Hall, Beverley.

PORTSMOUTH.—April [illegible]th.—For the [illegible] hospital, for the corporation.—Mr. A. E. Tutte, architect, 58 Londonderry North End, Portsmouth.

HOLMFIRTH.—April 20th.—For the [illegible] electricity works, for the urban district council.—Mr. A. B. Mountain, engineer, St. Andrew's-road, Huddersfield.

CARSHALTON.—April 21st.—For the [illegible] of public conveniences, for the urban district council.—Mr. W. W. Gale, surveyor.

LEEDS.—April 21st.—For repairs to school buildings, for the Education Committee.—The Architect, Education Offices, Leeds.

CHERTSEY.—April 22nd.—For the erection of an additional engine-house, gas generating house, new workshop and coal store adjoining the present pumping station, Byfleet Village, together with engine-sheds and other buildings, for the rural district council.—Mr. Charles Muggleton, Byfleet-corner, West Byfleet.

LEEDS.—April 22nd.—For alterations to the central public library, for the corporation.—Mr. W. T. Lancashire, city engineer.

WETHERBY.—April 22nd.—For the reconstruction of a bridge, for the rural district council.—Mr. A. G. Kilner, surveyor, Council Offices.

TETBURY.—April 23rd.—For sinking a borehole, for the urban district council.—Mr. H. J. Weaver, consulting engineer, Northgate Mansions, Gloucester.

EDINBURGH.—April 24th.—For the erection of a public convenience, for the corporation.—Mr. T. Hunter, town clerk.

BUCKLOW.—April 27th.—For the construction of a concrete tube culvert, for the rural district council.—Mr. R. C. Cordon, highway surveyor, Cranford-avenue, Knutsford.

UXBRIDGE.—April 27th.—For the erection of a corrugated-iron bathing shed, for the urban district council.—Mr. W. L. Eves, surveyor, 54 High-street, Uxbridge.

NEWYLN.—April 28th.—For the construction of a reinforced-concrete face wall, for the Pier and Harbour Commissioners.—Messrs. Douglass, Lewis & Douglass, 15 Victoria-street, Westminster, S.W.

GLASGOW.—April 29th.—For the wright and joiner's work in connection with the erection of a sanatorium and children's home, for the corporation.—Office of Works, 64 Cochrane-street, Glasgow.

Iron and Steel.

WATFORD.—April [illegible]th.—For the supply and [illegible] cast-iron socket pipes, including two Lancashire boilers, erection of a chimney shaft, supply of pipes and specials, and laying water mains, for the urban district council.—Mr. D. Waterhouse, engineer, Council Offices.

MANCHESTER.—April 20th.—For the supply of steel girder tramway rails and fishplates, for the Tramways Committee.—Mr. J. M. McElroy, general manager, 55 Piccadilly, Manchester.

LEEDS.—April 24th.—For the supply of cast-iron pipes and retort castings, for the Gas Committee.—Mr. W. B. Leech, general manager, Gas Offices, Market Hall, Leeds.

ST. PANCRAS.—May 11th.—For steel constructional work, for the borough council.—Mr. C. H. F. Barrett, town clerk.

GOSPORT AND ALVERSTOKE.—May 13th.—For the supply of a pair of 18-in. stroke horizontal cross high-pressure, double-acting air compressors, with all necessary valves, pipe connections and foundations, for the urban district council.—Mr. H. Frost, engineer and surveyor, Gosport.

Roads.

BENFIELDSIDE.—April 17th.—For the supply of machine-broken whinstone, machine-broken slag, tarred slag-macadam, and limestone dust, for the urban district council.—The Surveyor, Council Offices, Shotley Bridge.

LEEDS.—April 17th.—For flagging and tar-macadamising certain streets, for the corporation.—Highways and Permanent Way Department, 155 Kirkstall-road, Leeds.

RUSKINGTON.—April 17th.—For the supply of granite, slag, and ironstone, for the urban district council.—Mr. Ernest H. Godson, clerk.

WORKSOP.—April 17th.—For the supply of broken granite, tarred dross, broken dross, dross chippings, and fine limestone asphalt, for the urban district council. Mr. J. Whitaker, surveyor.

DEVON.—April 19th.—For surface-tarring 118 miles of roads, for the county council.—Mr. R. N. Stone, county surveyor, No. 1 Division, The Square, Exeter.

HORNCASTLE.—April 19th.—For the supply of road materials, for the urban district council.—Mr. F. Webber, surveyor.

REIGATE.—April 19th.—For the supply of road materials, for the corporation.—Mr. F. T. Clayton, borough surveyor.

WEST SUFFOLK.—April 19th.—For haulage, and the supply of local stone, gravel, sand, and stoneware pipes, for the county council.—Mr. W. L. Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

NORMANTON.—April 19th.—For the supply of stone and concrete flags, kerbs, channels, setts, granite, limestone, whinstone, limestone and granite chippings, and tar-macadam, for the urban district council.—The Surveyor.

MUTFORD AND LOTHINGLAND.—April 20th.—For the supply of granite, for the rural district council.—Mr. H. Blewitt, surveyor, Council Offices, Oulton Broad, Lowestoft.

NEWMARKET.—April 20th.—For the supply of 6,000 tons of best broken Leicestershire granite, chips and slag, for the rural district council.—Mr. F. J. Blackbourn, clerk, Deva Chambers, Newmarket.

ARMAGH.—April 21st.—For the supply of whinstone, limestone, and limestone chippings, for the urban district council.—The Surveyor, City Hall.

HARWICH.—April 21st.—For making up a road, for the corporation.—Mr. F. H. French, borough surveyor.

ISLE OF THANET.—April 21st.—For the supply of 1,533 yds. broken flints, and 1,295 tons broken granite, for the rural district council.—Mr. G. L. Butterworth, surveyor, Birchington, near Ramsgate.

WOODHALL SPA.—April 21st.—For the supply of granite chippings and tarred limestone, for the urban district council.—Mr. E. E. T. Bolton, surveyor.

GLOUCESTER.—April 22nd.—For the supply of stone and hauling, for the rural district council.—Mr. F. E. Weaver, surveyor.

RHONDDA.—April 23rd.—For the supply of 300 tons of dehydrated or refined tar, for the urban district council.—Mr. E. H. Barber, engineer and surveyor, Pentre, Rhondda.

ALDERLEY EDGE.—April 24th.—For the supply of 240 tons of tar-macadam, for the urban district council.—The Surveyor.

MIRFIELD.—April 24th.—For making up two streets, for the urban district council.—Mr. Edwin Gill, engineer and surveyor, Council Offices.

OAKHAM.—April 24th.—For the supply of broken granite, broken slag, granite or slag tar-macadam, and refined tar, for the urban district council.—Mr. A. L. Parker, engineer and surveyor.

WIGAN.—April 24th.—For paving with granite setts portions of certain streets, for the corporation.—Mr. A. T. Gooseman, borough engineer.

SOWERBY BRIDGE.—April 24th.—For paving and other work, for the urban district council.—Mr. J. Eastwood, surveyor.

WITHAM.—April 24th.—For the supply of granite chippings, for the urban district council.—Mr. W. P. Perkins, surveyor.

WROTHAM.—April 24th.—For the supply of team labour and steam rolling, for the urban district council.—Mr. F. T. Elliott, surveyor.

AIRDRIE.—April 26th.—For the supply of road metal, kerb and channel work, granolithic paving and carting, for the corporation.—Mr. J. K. Frazer, burgh surveyor.

BURGESS HILL.—April 26th.—For the supply of granite and 10,000 gallons of refined coal tar, for the urban district council.—The Surveyor.

WARMLEY.—April 26th.—For making up a road, for the rural district council.—Mr. H. W. Bennett, surveyor.

WIGAN.—April 26th.—For the supply of granite setts, for the corporation.—Mr. A. T. Gooseman, borough engineer.

ST. NEOTS.—April 27th.—For the supply of broken

gravel, basalt, tar-macadam, and slag dust, for the ensuing district council.—Mr. J. Eday, surveyor.

SAFFRON WALDEN.—May 1st.—For the supply of granite macadam and granite chips, for the corporation.—Mr. A. H. Forbes, borough surveyor.

EAST GRINSTEAD.—May 12th.—For making up a road, for the rural district council.—Mr. C. Turton, surveyor, 6 High-street, East Grinstead.

THINGOE.—For the supply of granite, for the rural district council.—Mr. A. Cameron, Board Room, Bury St. Edmunds.

Sanitary.

DONCASTER.—April 17th.—For a week of scavenging, for the rural district council.—Mr. H. Thirlwall, sanitary inspector.

STEYNING.—April 19th.—For the removal of house refuse, for the rural district council.—Mr. A. Flowers, clerk.

THURROCK.—April 19th.—For the construction of about 4 miles of stoneware and iron sewers of 9-in., 12-in. and 15-in. diameter, with manholes and other appurtenances, engine-house, screen chambers, suction tank, and about 1½ miles of 12-in. pumping main, for the Joint Sewerage Board.—Mr. G. Midgley Taylor, engineer, Caxton House, Westminster, S.W.

OYSTERMOUTH.—April 20th.—For the construction of a stoneware pipe sewer, for the urban district council.—Mr. W. P. Puddicombe, surveyor.

GATESHEAD.—April 24th.—For the supply of disinfectants, for the corporation.—Medical Officer of Health.

NEW ROSS.—April 26th.—For the construction of sewerage works, for the urban district council.—The Clerk.

RAWMARSH.—For relaying part of the main sewers in the South Ward, comprising about 700 yds. of 18-in. pipes or tubes, and 700 yds. of 9-in. pipes, with manholes, flushing chambers, and ventilation shafts, for the urban district council.—Mr. J. A. Tonge, engineer, Parkgate, Yorks.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
: Provisionally accepted.

BREDBURY AND ROMILEY.—Accepted for the supply of road materials, for the urban district council.—Mr. R. Hardman, surveyor:—

7-in. Setts.—D. T. Alderson, Turton, 15s. per ton; H. Heys & Co., Stacksteads, 17s. 6d. per ton; Brooks & Brooks, Cloughfold, 17s. 6d. per ton.

12-in. by 6-in. Edgings.—Brooks & Brooks, Cloughfold, 2s. 6d. per lineal yard.

3-in. Sawn Flags.—Brooks & Brooks, Cloughfold, 7s. 2d. per super. yard.

Local Setts.—Squire Hall, Hayfield, 13s. per ton; W. Bennison, Romiley, 15s. per ton.

2½-in. Concrete Flags.—Croft Granite Company, Leicester, 3s. 8d. per super. yard.

Sanitary Pipes.—L. J. Crankshaw, Horwich.

2-in. and ½-in. Macadam Pwllheli Granite Company, Liverpool, 10s. 8d. per ton.

Basalt Macadam.—United British Basalts Road Stone Company, Buxton, 7s. 4d. per ton; Buxton Lime Firms, Buxton, 7s. 4d. per ton.

Slag Chippings.—J. Griffiths & Co., Wolverhampton, ¾-in., 5s. 3d. per ton; ½-in., 4s. 9d. per ton.

Pitch.—Manchester and Sheffield Tar Works Company, Sheffield, 20s. 9d. per ton.

Oil.—Manchester and Sheffield Tar Works Company, Sheffield, 4d. per gallon.

Trial Order for Brushes.—Yates & Co., Halifax.

Team Labour.—M. Howe, Woodley, 8s. 2d. per hour; P. Fidler, Romiley, 1s. 2d. per hour.

CLAYTON-LE-MOORS.—Accepted for the supply of road materials, for the urban district council.—Mr. A. Dodgson, surveyor:—

Granite Macadam and Granite Chippings.—Penmaenmawr and Welsh Granite Company, Penmaenmawr; Threlkeld Granite Company, Keswick.

Limestone Chippings.—R. Briggs & Sons, Clitheroe.

Kerbs.—Peacock Brothers, Blackburn; J. Southworth, Clayton-le-Moors; Exors. of A. Rushton, Clayton-le-Moors; H. Mercer, Clayton-le-Moors.

Setts.—Peacock Brothers, Blackburn; J. Southworth, Clayton-le-Moors; Exors. of A. Rushton, Clayton-le-Moors; H. Mercer, Clayton-le-Moors; Warne Brothers, Bransgill.

Flags.—Peacock Brothers, Blackburn; Brooks & Brooks, Cloughfold; J. Brooks & Sons, Halifax.

Sanitary Pipes.—J. Pace & Sons, Burnley; Wheatley & Co., Blackburn.

Ironwork.—E. Woolley, Accrington.

Brushes.—W. Edsforth, Accrington.

Incandescent Gas Mantles.—Pilot Gas Mantle Company, Exeter.

Pitch, Creosote Oil, Hydrated Tar.—J. Metcalf, Accrington; Rocmac, Limited, London.

Disinfectants.—Newton, Chambers & Co., Sheffield; Quibell Brothers, Newark; McDougall Brothers, Manchester.

Team Labour.—A. Broadley, Clayton-le-Moors.

Paving Works, Whalley-road.—A. Broadley, Clayton-le-Moors.

DARLINGTON.—The following tenders have been accepted by the rural district council:—

Disinfectants.—Killgerm Company; Sanitas Company.

Slag and Tarred Slag.—Samuelson & Co.; Bolckow, Vaughan & Co.

Tarred Whinstone.—Cradock, Allison & Co.

Whinstone.—Cradock, Allison & Co.; Gribdale Mining Company; J. Pearson, Limited; G. & W. Schofield.

Tools.—W. Ableson; W. G. Richardson.

Scavenging contracts were accepted as follows:—
Commondale.—J. J. Leggott, £8.
Castleton.—W. Booth, £24.
Ainthorpe and Danby End.—G. Brack, £11.
Easington.—J. Seelman, £4.
Dunsdale.—J. W. Scaife, £96.
Lazenby.—F. C. Brighton, £19.
South and Old Lackenby.—F. C. Brighton, £10 10s.
Low Lackenby.—A. Dobson, £12.
Wilton.—F. C. Brighton, £9.
New Marske.—M. A. Moscrop, £9.

DRIFFIELD.—The following tenders have been accepted by the rural district council.—Mr. T. Casson Beaumont, surveyor:—

2-in. and 2½-in. Machine-broken Whinstone (at Driffield and other stations).—Ord & Maddison, Limited, Darlington, 11s. 5d., 11s. 2d.; R. Summerson & Co., Limited, Cockfield, R.S.O., Co. Durham, 11s. 5d., 11s. 2d.; J. F. Shackleton & Son, Goole, 11s.; Cradock, Allison & Co., Limited, Eaglescliffe, R.S.O., Co. Durham, 10s. 9d., 10s. 7d.; Gribdale Mining Company, Limited, Middlesbrough, 11s. 2d., 10s. 11d.; H. Mead & Son, Limited, Hull (at wharves), 12s. 6d.

Unbroken Whinstone.—G. & W. Schofield, Grosmont, Yorks (at Driffield station), 7s. 11d.

Broken Slag.—Gladstone & Co., Grosmont, Yorks (at Gorton and other stations), 6s. 3d.; W. Schofield & Son, Grosmont, Yorks, 6s. 3d.; Sir B. Samuelson & Co., Limited, Middlesbrough (at Driffield station), 6s. 4d.; Clarkes Extension, Limited, Leeds (steel slag), 8s. 5d.

Tarred Chippings.—Cradock, Allison & Co. (¾-in. and ⅜-in.), 13s. 3d., 13s. 7d.

EARSDON.—Accepted for the supply of hand-broken whinstone slag, whinstone kerb, and cartage, for the urban district council.—Mr. J. R. McMillen, surveyor, Shiremoor, Northumberland:—
Whinstone.—M. Appleby, Lesbury, Northumberland.
Kerbstone.—J. Wilkie, Newcastle-on-Tyne.

HOVE.—For the construction of a public cemetery lavatory, for the corporation.—Mr. H. H. Scott, borough surveyor:—
McKellar & Westerman, Hove, £63.

PATRINGTON.—Accepted for the supply of road stone, for the rural district council.—Mr. W. H. Snaith, surveyor:—
Cradock, Allison & Co., Eaglescliffe, Co. Durham.—3,000 tons at 11s. 3d.
J. F. Shackleton & Son, Goole, Yorks.—1,000 tons at 10s. 5d. to 10s. 7d.
Gribdale Mining Company, Middlesbrough.—750 tons at 11s. 6d. to 11s. 11d.
Monkhouse & Peart, Wearhead, Co. Durham.—750 tons at 11s. 9d. to 12s. 2d.
Ord & Maddison, Darlington.—750 tons at 11s. 9d. to 12s. 2d.
Summerson & Co., Cockfield S.O., Co. Durham.—750 tons at 11s. 9d. to 12s. 2d.
H. Mead & Co., Hull.—300 tons at 11s. 3d. to 11s. 6d. Slag, 300 tons at 8s. 3d. to 9s.
M. Dunn, Hessle, E. Yorks.—Gravel, 400 tons at 4s. 6d., 5s., 6s., 6s. 9d. Running gravel, 750 tons at 4s. 6d., 4s., 5s. 6d., 5s. 9d.

SURBITON.—Accepted for the supply of road materials, for the urban district council.—Mr. H. T. Mather, surveyor:—
Team Labour.—A. Redington, Surbiton.
Broken Granite and Chippings.—Clee Hill Granite Company, Limited, Ludlow.
Concrete Paving Flags.—Alexandra Paving Stone Company, Limited, Southampton-row, W.C.
General Stores.—J. F. Palmer, Surbiton.
Repair of Burst Water Pipes.—W. H. Cook, Surbiton.
Cast-iron Goods.—J. Gibb & Co., Limited, Fenchurch-street, E.C.
Tools.—Swinden & Co., Limited, Queen Victoria-street, E.C.
Smiths' Work.—J. Jupp, Surbiton.
Tar Pavings.—J. Smart & Son, Walsall.
House Refuse Removal.—A. Redington, Surbiton.
Granite Kerbing.—Wettern Brothers, Limited, Great Tower-street, E.C.
Flints.—Smeed, Dean & Co., Limited, Sittingbourne, Kent.
Gravel.—Jupp & Co., Limited, Surbiton.
Scavenging.—J. & C. Stickley, Surbiton.
Slag Tarred Macadam.—J. Smart & Son, Walsall.
Brooms.—W. & F. Archer, Upper Edmonton, N.
Lubricating Oils.—J. F. Palmer, Surbiton.
Sludge Press Cloth.—Woods, Sons & Co., Glasgow.

MEETINGS.

Secretaries of public bodies are invited to send early notice of dates of forthcoming meetings.

APRIL.

16.—Town Planning Institute: Mr. W. T. Lancashire, M.INST.C.E., and Mr. H. V. Lanchester, F.R.I.B.A., on Replanning and Redevelopment in Existing Centres. 92 Victoria-street, S.W., 8 p.m.

16.—Institution of Mechanical Engineers: President's Address. 8 p.m.

17.—Institution of Municipal and County Engineers: Council Meeting.

21.—Roads Improvement Association: Annual General Meeting. Institution of Civil Engineers. 4 p.m.

23.—Institution of Municipal Engineers: Visit to London New County Hall Works. 2.30 p.m.

26.—Royal Sanitary Institute: Dr. W. Perrin Norris, chief medical officer, Medical Bureau, Commonwealth of Australia, on "The Evolution of Hygiene and Public Health in Australia." 5 p.m.

30.—Institution of Municipal and County Engineers: Metropolitan District Meeting at Westminster.

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. APRIL 23, 1915. No. 1,214.

Minutes of Proceedings.

Town Planning in Built-up Areas.

At a meeting of the Town Planning Institute held on Friday last, two very interesting papers on "Replanning and Reconstruction in Existing Centres" were read. The first paper was presented by Mr. W. J. Lancashire, M.INST.C.E., the city engineer of Leeds—a city which has had a very full experience of the improvements expense which inevitably attends the comprehensive attempts to grapple with the errors of the past in regard to city development. Although a large part of Mr. Lancashire's paper was occupied with a narrative of some of the large improvements which have been effected at Leeds under his supervision, many of his observations in regard to the widening and improvement of streets, the rebuilding of old areas of towns, and the clearing of unhealthy areas were of general interest. The enormous growth of Leeds, like that of many other towns, was primarily due to the great industrial revival of the nineteenth century. In 1801 the population was only 53,162, but with an average increase during each succeeding decade of 35,660, the estimated present population is no less than 465,000. This rapid increase appears to have taken place without regard to any comprehensive plan or design, with the result that the citizens of to-day are faced with a very great, though necessary, expenditure for the improvement of travelling facilities and the clearance of slum areas. Mr. Lancashire gave some striking figures to illustrate the costliness of the shortsighted policy of the past. Putting first things first, he pointed out that the cost in human life has been almost incalculable. For example, the death-rate in the York-street area was as high as 39·16 per 1,000 in 1893-5, as compared with a death-rate for the whole city of 20·26, while in the Quarry-hill area the respective rates were 28 and 19·8. The annual cost to the city of improving these two areas represents a rate of about 4d. in the £ at the present time, and the expenditure is not yet complete. It will be seen, therefore, that even when the proceeds of the sale of surplus lands are taken into consideration as a credit, the nett cost to the city on final completion will be very heavy.

It is, of course, impossible to say how much of this might have been saved by prudence and foresight, and in these as in other matters it is easy to be wise after the event. It, however, the present generation has to suffer for the mistakes of the past, it can at least profit by the experience and take every care not to repeat the errors. And herein lies the force of Mr Lancashire's [illegible] that a replanning scheme will [illegible] which are forced to the front when a general and comprehensive view is taken of the problem of [illegible] in the place apparently desirable that each municipality should have its plan indicating the improvements to be carried out as time, opportunity, and money allow. Before leaving this paper we may perhaps refer to one matter of detail. In the remodelling of a central area—or indeed in the execution of a comparatively simple street improvement—considerable expense is invariably incurred in the disturbance of cables and pipes. It is therefore interesting to observe that [illegible] sewages of a length of about 2,177 yds. have already been constructed to accommodate gas, water, electricity and other mains and services.

The other paper to which we referred above was from the pen of Mr. H. V. Lanchester, [illegible] and is interesting to note that in speaking of Indian experience, the essential factors of the problem were the same as in this country. This is exemplified by the preparation of a general comprehensive improvement plan as against the method of dealing with improvements in isolated instalments. Further, two of the primary considerations [illegible] were those of health and traffic. The problem of health is even more difficult in India than it is here, for although we are told that in many respects the inhabitants of India are cleanly and methodical in their habits, we know that in others they are quite the reverse. Moreover, the crowding of an area with badly built houses inevitably facilitates epidemics of plague, a disease which it is well known is transmitted by rats. Both papers showed that the administrators of the present, if they are wise, will profit by the mistakes of the past, and, by wise expenditure and the exercise of foresight, lay a better and surer foundation for the future well-being of city dwellers.

* * *

Reports on Dublin Housing.

The Housing Committee of the Dublin Corporation have received from a sub-committee a report upon certain recommendations submitted last year by Mr. Raymond Unwin and Professor Patrick Geddes on the subject of the housing of the working-class population of the city. The gentlemen named had made a number of far-reaching proposals from the town planning point of view, their main recommendation with respect to housing being that the corporation should

acquire land on the outskirts of the city area and build there working-class dwellings of reasonable accommodation, provided with gardens. Other suggestions included a series of street improvements and the clearing of congested areas behind main streets so as to improve the condition of the buildings fronting upon those streets, the provision of playgrounds, and the development of land for building purposes, with the minimum account of expenditure in street works, by the planning of squares of houses accessible from the existing main roads by means of footpaths or inexpensive carriage drives. The sub-committee, while accepting with gratitude the report of the experts for what it is worth, candidly confess their disappointment at its lack of information with respect to certain outstanding considerations that appeal to them—namely, the specific economic advantages regarding the lay-out of the clearance schemes which were before the Dublin Town Council, and detailed plans of more roomy dwellings for the same price as was estimated for those which the Housing Committee proposed to provide. The sub-committee also point out that, as regards the opening up of new connections, this had been anticipated at the recent official inquiry by the borough surveyor, who, upon Mr. P. C. Cowan, the Local Government Board inspector, indicating how necessary it was, stated that in future he would see the survey of each site in the initial stage, so as to make provision for such eventualities.

There is certainly a curiously negative quality about the comments of Mr. Unwin and Professor Geddes which did not escape the attention of the sub-committee. "We recognise," they state, "that a considerable proportion of the population of Dublin, owing to their exceedingly low wages, must be housed in the central areas of the town, and in houses of low rental, but we submit that the best policy to adopt in order to help these people is to remove to better houses built on cheaper virgin soil on the outer areas within the city boundary the very considerable number who could and, if they had the chance, would live there." The sub-committee proceed to point out that practically the most serious problem of Dublin housing is concerned not so much with the economic tenant as with the uneconomic or poverty class, who cannot afford to pay 6s. 6d. a week rent and tram fares to and from the outer areas of the city. The subject will doubtless receive further consideration at the hands of the town council, but meanwhile it is permissible to suggest that its treatment by Mr. Raymond Unwin and Professor Geddes will have served a useful purpose if only it helps to bring into bold relief the contention of the sub-committee that, as regards housing, Dublin cannot be considered as similarly circumstanced to an industrial English city.

* * *

The Corrosion of Iron.

It is quite within the bounds of possibility that at some time in the future the corrosion of the interior and exterior surfaces of water mains will be absolutely prevented on all good work as a matter of course. That such corrosion can be prevented is proved by the instances in which scientific advice has been properly followed with good results. Unfortunately there are a much larger number of instances in which no attention has been given to the matter of corrosion at all, or in which the advice of the expert has been partly or entirely ignored, the result being that in the vast majority of cases considered as a whole immense sums have to be spent annually on maintaining systems owing to the effects of corrosion.

Mr. W. J. E. Binnie has done excellent work in once again bringing this subject forward for discussion in a valuable paper read before the Institute of Sanitary Engineers and given elsewhere in these pages. The paper deals with the subject very fully, discussing the various theories of corrosion and indicating some of the possible means of prevention. Seeing that most waters attack iron pipes, owing to the solvent action of the dissolved carbonic acid and oxygen, Mr. Binnie is in favour of the de-aëration of water entering mains under certain conditions. This interesting and apparently simple method does not appear to have received hitherto the trial it deserves. The author tells us that this process was recommended for the treatment of the water in the Kalgoorlie main—350 miles in length and 30 in. in diameter—which gave great trouble clearly because the advice of the experts had not been followed. It is evident that the corrosion of this main and the subsequent troubles might have been entirely prevented if in the first place the pipes had not been brought into contact with earth of a corrosive character on the outside and with water of a corrosive character on the inside. When only part of the advice given by the author's firm was followed, the internal corrosion almost ceased. The simple addition of three grains of lime per gallon effected the change in this particular water, and there can be no reason to doubt that if the advice of the experts had been followed in its entirety the corrosion would have ceased absolutely.

All experience tends to show that the laying of pipe mains is not the simple business that has sometimes been imagined. The nature of the soil, the quality of the water, the quality of the cast iron, wrought iron, or steel of which the pipes are made, and the protective coating, have each to be considered, and probably the most important of these is the quality of the water and the particular treatment required to render it non-corrosive. These are not matters which can be left to the ignorant. If they are not dealt with by the expert the usual troubles due to corrosion are likely to occur. It is time that the fact should be grasped that such troubles, with their attendant waste of money, are preventible, and ought to be prevented in all cases.

* * *

British Standard Specification for Portland Cement.

A new edition of the British Standard Specification for Portland Cement, one of the most widely adopted of the reports issued by the Engineering Standards Committee, has just appeared.* The Sectional Committee on Cement, presided over by Sir William Matthews, K.C.M.G., was formed in 1903, and the first report was approved by the Main Engineering Standards Committee and issued in 1904. The specification has been revised from time to time with a view of improvement in the quality of the cement, and the new edition just published contains further important modifications. Increased fineness of grinding of cement has been legislated for, and the minimum tensile strength at seven days of both neat cement and cement and sand has been raised. The clauses dealing with the preparation of the briquettes have been amplified, the procedure being described in greater detail than has previously been the case. In the case of both neat cement briquettes and cement and sand briquettes ramming or hammering is expressly prohibited.

The growth of tensile strength at twenty-eight days, both for neat cement and cement and sand, is now given in the form of a formula in place of the fixed percentages which have been specified

* Price 5s. nett.

hitherto. While not making any material alterations to the figures previously laid down for the growth of the tensile strength at twenty-eight days over that at seven days, the formula gives a progressive increase instead of the somewhat irregular steps of the method previously adopted, and for use in the test house lends itself to the construction of a curve from which the breaking strength at twenty-eight days corresponding to any ascertained breaking strength at seven days could readily be read off. With the view of making easier the determination of what constitutes a visible impression in the test for final setting time, the Vicat needle for this test is provided with a fixed metal circular cutting edge set half a millimetre back from the point, as this length is sufficient to clear the scum which sometimes forms on the surface of the pat. The cement is considered to be finally set when the needle makes an impression on the pat and the attachment fails to do so. All the plates have been entirely redrawn, and two new plates have been added to the specification, one of the latter dealing with a standard spatula for use in making up the cement and sand briquettes, and the other showing an improved form of specific gravity bottle which the committee have approved as suitable for use, though they do not stipulate for its employment to the exclusion of any other pattern. Instructions for obtaining the specific gravity of cement are given on the plate.

* * *

Domestic Electricity.

When it is remembered that until a few years ago the use of electricity for the purposes of heating and cooking was generally considered as a luxury beyond the reach of all except the wealthy class, it will be apparent that enormous strides have been made recently in the development of the industry in this direction. At the present time it is commonly said that the use of current for household and domestic requirements opens up one of the largest fields for enterprise for the immediate future. The great commercial possibilities of the situation are shown by the fact that many large cooking installations have been made in restaurants, while the electric heating of bedrooms in hotels becomes more common. It appears, therefore, that in dealing with the subject of "Electrical Heating and Cooking Apparatus" in a paper which he read recently before the Junior Institution of Engineers, Mr. Stanley M. Hills, A.M.I.E.E., was concerned with a matter of immediate practical importance. He pointed out that the renewed competitive energy displayed by gas companies on the introduction of the incandescent gas mantle has led electricity supply authorities to look for fresh fields of demand as a means of increasing their total output. In order that the domestic demand may be fully developed, three things appear to be essential. In the first place current must be cheap—so cheap indeed that the consumer can afford to waste it. Next, the apparatus and utensils must be both good in quality and simple in use. Mr. Hills observes that if more supply authorities offered electrical energy at a halfpenny a unit for cooking purposes, the demand for cookers and heaters would be considerably increased, with the result that the manufacturers could afford to supply better articles at the current prices or thereabouts. Finally, consideration should be given to the ignorance of the ordinary householder in regard to electrical apparatus, and he should be assisted by an occasional visit from an inspector or instructor. Many a difficulty and groundless complaint would thus be avoided, and the best advertisement—namely, satisfied customers—would be obtained.

Testing Materials.

Among the subjects dealt with in the presidential address which Dr. W. Cawthorne Unwin delivered on Friday evening last before the Institution of Mechanical Engineers, was that of the testing of the materials of engineering construction. Upon such a topic, few men can speak with greater authority. He pointed out that whereas half a century ago most materials of construction were selected and bought on the reputation of the manufacturer, at the present time hardly any material in large use is accepted without special testing in the interests of the purchaser. Even so, many of the tests in ordinary use are of quite an arbitrary character, and do not imitate the conditions of actual service. For example, as Dr. Unwin reminded his hearers, we test specimens of steel to destruction and measure ductility by plastic deformation, though in use the stresses do not exceed the elastic limit and the deformation is elastic. Again, we test cement in tension and use it in compression. All this shows the necessity for constant intelligent criticism of existing methods and for keeping an open mind with regard to possible improvements in method. One reform which may at once be advocated is the establishment of public laboratories, supported by the State, where anyone can have tests made, at moderate fixed rates, by a trained scientific staff, and with great accuracy. Such laboratories are in existence both in the United States and Germany, in both of which countries their work has been found to be of the greatest value. They have the advantage over private laboratories that they are under the direction of experts of exceptional experience and reputation, and are able to pursue investigation, continued often for long periods, beyond immediate requirements into fruitful by-paths. Moreover, results may be published freely, so far as is compatible with the maintenance of the private interests involved.

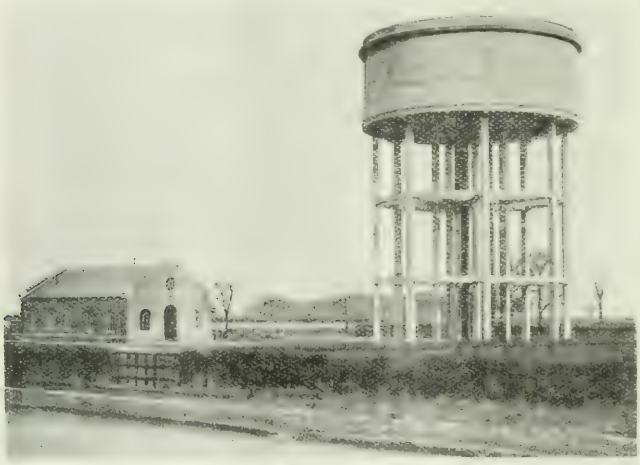
Munitions and Municipalities.

Apparently the idea of appealing to local authorities to release employees so that they can be transferred to the nation's service to assist in manufacturing munitions of war is proving an unqualified success. Everywhere there are indications that the most willing responses are being made. At Darlington, for instance, Mr. Bicknell, of the Local Government Board, stated on Saturday that in eight different centres he had visited he had been promised every assistance. In Cardiff alone 2,000 men are available, in Birmingham well over 1,000, in Leeds 750, in Leicester 400, in Bolton 150. In Newcastle, to take but another example, the Government is asking for 500 employees. Apply such figures all over the kingdom and it will be seen that the assistance obtained will be splendid. Practically it is universal, though we have seen one reported case where an authority held that "the matter did not apply" to its particular district. It is difficult to see how any area in England can claim exemption from its patriotic (and by no means disinterested) duty to share in providing for its own continued freedom from alien rule, and this was the view naturally taken by the Local Government Board inspector who visited the council's offices, for he selected twelve of its employees for possible use. We gather that in such selections preference is given to those who are not concerned with the work of sanitation. The roads may suffer for a time, but even if these be unpatched and unswept no one can reasonably cavil under the circumstances. "Shells, and yet more shells" is the clarion call which is now the loudest in the land.

Thorne and District Waterworks.

By F. GRAHAM FAIRBANK, M.INST.C.E.

For many years before the completion of the undertaking briefly described in the present article,* the town of Thorne, in the south-eastern portion of the West Riding of Yorkshire, was under the reproach of drawing the bulk of its drinking water from the Keadby and Doncaster Canal, and from shallow wells which were affected by the rainfall and heavily impregnated with impurities. The other towns in the district derived their supplies of drinking water chiefly from shallow wells. These sources of supply have been characterised as unsatisfactory for over thirty years by various authorities.



Pumping Station and Water Tower at Hatfield, near Doncaster.

In view of the large increase of population in Thorne and the surrounding districts, a number of local residents promoted the Thorne and District Water Act, in the year 1910, with the object of placing the water supplies of the district on a thoroughly satisfactory basis, and, as the rural district council felt that their hands were already sufficiently full with a large drainage scheme and other works for the purpose of meeting the large increase in population brought into the district by the development of the coal workings, a public company was formed to carry out the waterworks undertaking. The area to be supplied covers about 37 square miles in all.

In obtaining the Act the promoters obtained a report from their engineers, Messrs. Fairbank & Son, M.INST.C.E., of York, as to the best method of supplying the district with water, the measures then recommended being, briefly, as follows:—

(1) To sink a well and borehole, and construct a pumping station at Hatfield, near Doncaster.

(2) To utilise this pumping station to supply Hatfield and Thorne, with extensions, if required, to Stainforth and Fishlake.

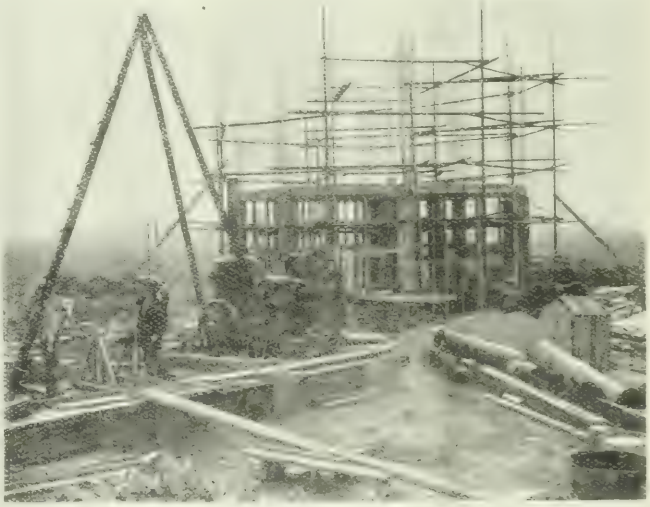
(3) To construct a second pumping station at Thorne, when necessary, for the supply of additional consumers.

(4) To make the delivery main between Thorne and Hatfield large enough to work both ways, so that each pumping unit may be capable of helping the other in the future.

Having sunk a well at Hatfield, an abundant supply of good water was encountered, and, in accordance with the advice of their engineers, the company decided to confine operations at the outset to the supply of Hatfield and Thorne only, while making the well and bores, machinery and water-storage reservoir of sufficient dimensions and capacity to supply Fishlake and Stainforth later.

The contract for the foregoing works was let to Messrs. Parker & Sharp, of York, and the reservoir, which consists of a ferro-concrete tower surmounted by an elevated storage tank with a capacity of 150,000 gallons, was constructed by the Yorkshire Hennebique Contracting Company, Limited, of Leeds.

One of the most interesting features connected with the execution of the works was the laying of a set of duplicate mains beneath the waters of the canal, which was duly laid near the swing bridge at Thorne. A special trench was made in the bed of the canal for the reception of the water company's mains. Two lengths of duplicate mains, each 80 ft. long, were fixed together on the surface. Powerful cranes then lifted these until the pipes, which had been bent and clamped to fit into the channel prepared for them, extended over the water. On the word being given the pipes were lowered to a depth of some 13 ft. or 14 ft. below the surface of the water and fixed in position, the ends on either side of the canal being linked up with the mains running to Hatfield and Thorne respectively. Concrete was then deposited under water over the mains to consolidate and protect the work.



Hatfield Water Tower under Construction.

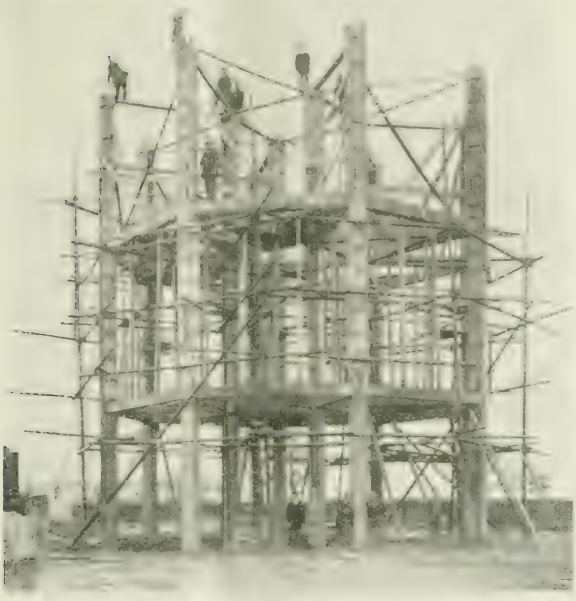
* Reproduced from the April Issue of *Ferro-Concrete*.

The mains passing under the canal are carried in duplicate valves so that if one main goes wrong there will always be another to fall back upon.

The water supply is derived from two boreholes at Hatfield. Each is 9in. in diameter, sunk into the gravel and chalk. The pumping station is the orthodox and plant to the water tower as shown by the photograph superheated, and water is pumped directly into the storage tank, whence it flows by gravitation through a 7in. diameter cast-iron main to the mains at Hatfield and Thorne.

The engine-house is constructed of brick with a slated roof. The pumping plant consists of two 18-b.h.p. Campbell type gas engines, and the power is supplied by duplicate suction-gas plants. The pumps are two-throw, of the horizontal type, and each has a capacity of 5000 gallons per hour.

The water tank is an interesting structure, and forms a dept. of 15ft. The steel work is designed to take [illegible] gallons. In the centre of the tank is a steel cylinder [illegible] compartments [illegible] the



Hatfield Water Tower Erecting for Reinforced Concrete Construction

supply to be kept up to the two towns during such times as the tank is being cleaned out, or emptied for any other purpose.

The bottom of the tank is 40ft. above the surface of the ground, the supporting tower, as well as the tank, having been constructed in Mouchel-Hennebique ferro-concrete in accordance with working details prepared for the engineers by Messrs. L. G. Mouchel & Partners, of Westminster. The ferro-concrete columns are carried down to the solid rock, and to provide means of access to the covered top of the tank a ladder is carried through the centre in a cylindrical tube concentric with the two water storage compartments. All inlet and outlet pipes connected with the tanks are provided with special expansion joints.

The whole of the work was executed by the contractors in a highly satisfactory manner, and the new waterworks undertaking has been in operation for the last eighteen months, the excellent quality of the water and the general efficiency of the services having been much appreciated throughout the district.

Surveyors' Institution.—An ordinary general meeting will be held in the Lecture Hall of the institution on Monday next, when the adjourned discussion on the papers delivered by Mr. C. S. Joseph and Mr. R. Strachan Gardner (Fellow), on "The Report of the Land Inquiry Committee on Housing," will be re-opened by Mr. W. E. Riley, architect of the London County Council. The chair will be taken at 8 o'clock.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

ELECTION OF COUNCIL: COLONIAL HON. DISTRICT SECRETARY'S COMPLAINT.

Mr. T. W. Stainthorpe, hon. secretary (pro tem.) of the African District of the Institution of Municipal and County Engineers, has addressed the following [illegible] that body.

272 Union Buildings,
Pretoria.
March 21, 1914.

[illegible] Election of Council, etc.

Dear Sir,—Yours of February 13th to hand, with ballot paper for the annual election of council, which I received on March 27th.

With regard to the meeting I am arranging for, it [illegible] August at Johannesburg, and I am anxious that it should be a great success, worthy of the institution and of the "Golden City" on the Rand. As requested, I will arrange to have a report of the meeting forwarded [illegible]

I desire to draw your attention to the fact that I received the ballot paper here fifteen days after the [illegible] was supposed to be [illegible] in London. This spells disfranchisement for all our South African members, to say nothing of apparently being somewhat ignored by such a farcical and foolish arrangement. Such business methods cause one to gasp and to wonder when we may expect a little more intelligence and recognition under the new [illegible]

I also would like some information about what seems a very irregular and hole-and-corner examination, which, I am informed, has been recently held at Port Elizabeth. Kindly supply me with the facts of this alleged affair.

As a member of over thirty years' standing, and who has laboured several years to raise the professional status of the municipal engineer in South Africa, by examinations and other available means within my cable-tow, I strongly and emphatically protest against this slipshod and unfair method of treating our South African members. It is true we are not numerically strong, but we are "doing our bit" in the Empire (in many cases under arduous and difficult conditions), and it is up to the council to see that we in South Africa who are members of the institution receive both justice and courtesy, and not any more be asked to waste our time in filling up ballot papers which are due to be returned to you in London fifteen days before we can possibly receive them by mail!

Please lay this letter before the next meeting of the council, to whom I would respectfully appeal to give it their immediate consideration. I deeply regret to have to write so plainly, but I feel it my duty to do so in the true and future interest of the institution in South Africa. Failing a satisfactory reply, I shall back it up by severing my connection with the institution, which I shall be pained to do, after my long and pleasant experience with it.—Yours faithfully,

T. W. Stainthorpe,
Hon. Sec. (pro tem.), African District.

J. W. Robinson, Esq., Secretary,
Institution of Municipal and County Engineers.
92 Victoria-street, London, S.W.

P.S.—I am sending a copy of this letter for publication in England.—T. W. S.

National Road Exhibition.—This exhibition, organised by the County Councils Association, will be formally opened on June 25th by the President of the Local Government Board

Corrosion of Iron and Steel.*

By W. J. E. BINNIE, M.Inst.C.E., F.G.S.

It is not proposed to dwell at any length upon the economic side of the question, as the immense annual sums which have to be spent on maintaining iron and steel structures where exposed to corrosive influences must be well known to the members of the Institute of Sanitary Engineers. In addition to the question of maintenance, the actual capital cost of many structures is increased owing to the impossibility of gaining access for the purpose of maintenance. The author's professional experience has largely been gained in connection with waterworks; he will refer more particularly to this branch of engineering.

A water main can be taken as a very good example of the class of structure where access cannot be obtained for the purpose of maintenance. Pipes are generally of too small a diameter to allow of access to the interior, and are generally buried in the ground, which renders access to the exterior both difficult and costly. Even when the pipes are large enough to allow a man to enter, the exigencies of the water service seldom permit of their isolation for that purpose.

In the case of cast-iron water mains the actual corrosion, when it does occur, is not of great importance in reducing the actual strength of the pipe, except under exceptional circumstances. This is due to the fact that a very large factor of safety must of necessity be employed when using cast-iron subjected to tension due to the internal pressure of the water.

External corrosion of cast-iron pipes is therefore only important under exceptional conditions; but the effect of internal corrosion is very serious owing to the nodular incrustations which appear as the result of this action. The extent of this incrustation may be very slight if a hard water passes through the pipes; but when dealing with the soft moorland waters so largely used in the northern counties it is liable to become very serious in reducing the carrying capacity of the pipes.

It is therefore the general practice among water engineers to make an allowance for this future diminished carrying capacity by designing the pipes of such diameter as still to be able to pass the required quantity of water even after incrustation has taken place.

As an illustration of the economic effect of this point it would have been possible to save no less a sum than £60,000 on the pipe line which the author's firm are now carrying out for the Birkenhead Corporation if no loss of carrying capacity in the future were liable to occur.

It is possible to remove this incrustation by mechanical means, but it has not been found possible to restore the coating, with the consequence that the pipe rapidly deteriorates in carrying capacity after scraping, and the operation has to be repeated at comparatively short intervals. Nor can this method be employed beyond a certain limit, or the main would be unduly reduced in strength by the removal of the corroded material and the presenting of a fresh surface for attack.

With regard to steel pipes, the effect of internal corrosion is still more objectionable; not only the loss of carrying capacity, but also the loss of strength has to be allowed for. This is due to the fact that steel can stand high tensile strength, and therefore steel water mains are much thinner than cast-iron mains of the same diameter to stand the same pressure. It has been found that pitting due to corrosion seldom extends to a greater depth than $\frac{1}{8}$ in. As the tensile stress allowable for cast-iron pipe is only 2 tons per square inch as against 6 tons for steel, it follows that the steel pipe will be, theoretically, only one-third the thickness of the cast iron.

Supposing the cast-iron pipe were 1 in. thick, the loss by corrosion of $\frac{1}{8}$ in. will only represent a loss of strength of 12 per cent, whereas the steel pipe, being only $\frac{1}{3}$ in. thick, the loss of $\frac{1}{8}$ in. would decrease its strength by 40 per cent.

It is therefore good practice to allow an extra $\frac{1}{8}$ in. in thickness in the steel pipe to resist unavoidable corrosion.

This means that the economic bearing of corrosion on the use of steel pipes is even of more importance than it is for cast-iron pipes.

Various Theories to Account for Corrosion

It is now proposed to consider briefly various theories which have been put forward to account for the corrosion of iron. The subject is too wide and too technical to do more than glance at some of them.

For many years corrosion was thought to be a simple oxidation, but in 1838 Zumstein proved that the air did not corrode a polished iron cross which had been placed by him on the summit of Monte Rosa in 1820 and examined in 1821. The explanation is that at the low temperature which obtained at this elevation there was an almost complete absence of water vapour.

That dry air will not act on iron at temperatures below 100 deg. Cent. has since been confirmed by many other experiments. In the same way pure water free of all dissolved air is practically inert on iron.

It has been shown that oxygen and water vapour do not corrode iron unless the temperature falls to below the dew-point; but when condensation occurs corrosion becomes active.

This accounts for the fact that iron does not corrode where the conditions are such as to prevent condensation taking place. A good example of this can be seen inside Westminster Abbey, where the tie-bars which were introduced in the fourteenth century to give lateral support to the pillars supporting the roof are still in excellent condition.

Acid Theory of Corrosion.

Having now arrived at the point that water and oxygen are necessary for corrosion, the question presents itself as to whether corrosion is due to these elements alone. According to one theory the presence of an acid is also required, and this is found in the minute traces of carbon dioxide which are present in the atmosphere and in water.

This carbon dioxide combines with the iron to form soluble ferrous carbonate or ferrous hydrogen carbonate. The oxygen of the dissolved air then converts the soluble iron salt into ferric hydroxide which is deposited as rust and liberates carbon dioxide, which is free again to attack the iron; and so the process is repeated until protection may be found by the deposition of rust on the iron. This theory has found much support.

Electrolytic Theory of Corrosion.

Experiments carried out by Whitney and others were formerly held to be conclusive that an acid was not essential for corrosion which would take place if iron were introduced into water containing dissolved oxygen.

The action of alkalies and their inhibitory effect on corrosion had also been demonstrated, and the electrolytic theory put forward by Whitney furnishes an ingenious explanation.

This theory is, briefly, as follows: Water consists of oxygen and hydrogen, one atom of the former being combined with two of the latter. It is assumed that what are termed "ions" also exist both of hydrogen and a group in which oxygen and hydrogen are associated in a form called "hydroxyl." The ions of hydrogen carry a positive electric charge, and the hydroxyl ions a negative charge.

The presence of dissolved oxygen in the water tends to cause the hydrogen ions to combine, but they cannot do so unless they obtain a negative charge. This charge they obtain from the iron, which is then rendered soluble, the iron itself being changed into the ionic state and entering the water. Finding in the water hydroxyl ions, the iron ions combine with them, forming ferric hydroxide, or rust, which is deposited on the iron.

It will thus be seen that the electrolytic theory assumes that no acid is necessary for corrosion to take place. The experiments carried out by Friend, however, in which the greatest care was exercised to remove all traces of CO_2, appeared to show that corrosion did not take place when iron was introduced into water containing dissolved oxygen or air alone.

This point is one of great interest, but is still con-

* Paper read before the Institute of Sanitary Engineers, at Caxton Hall, Westminster, on April 14th, Mr. A. P. I. Cotterill, president, in the chair.

[illegible] on all, though the balance of opinion seems to be in favour of the electrolytic theory.

BIOLOGICAL THEORY.

The biological theory of corrosion, where the attack is attributed to the action of organisms, was put forward as a possible explanation of some of the conditions which prevented corrosion taking place, seeing that these conditions were also such as would destroy life. It can be shown, however, that corrosion does take place under conditions which would inhibit life, and we have therefore to look elsewhere for the true explanation.

Although corrosion takes place where no biological explanation is possible, organisms often play a most important part in accelerating corrosion, and the probable explanation is to be found in the action of their [illegible] excretions.

Internal corrosion of water mains is accompanied by the deposition of encrustations of a limpet-like form, the upstream face of the limpet being steeper than the downstream face. They rarely form to a greater height than 1¼ in. in large mains, and contain sulphur in larger quantities than could have been derived from the iron of the pipe. Sometimes organisms of a rosary or double spiral form are present, but not always. The limpets are hard without and soft within, and are composed of concentric layers of ferric oxide, the outer layers being sometimes black magnetic oxide. The iron below the limpets is invariably pitted by corrosion.

EFFECT OF DISSOLVED OXYGEN.

Whether the electrolytic or the acid theory be correct, the presence of dissolved oxygen in the water is essential before corrosion takes place. The question naturally presents itself as to whether comparative immunity from attacks could be brought about by the partial removal of the dissolved oxygen from the water.

The author's firm were consulted by the Western Australian Government with regard to the partial failure of the 30-in. pumping main between the Mundaring reservoir and Kalgoorlie, a distance of 350 miles, brought about by internal and external corrosion. They had the advantage of being associated with Sir William Ramsay and Mr. Otto Hehner, and it was the author's privilege to assist these gentlemen in the experiments which were carried out at University College to determine the best means of safeguarding the life of the main in the future. It was not very long before it became evident that the air dissolved in the water was essential for the internal corrosion to take place.

The first series of experiments showed that by partial removal of the dissolved oxygen the activity of corrosion was greatly reduced. Experiments were then carried out to ascertain whether any practical apparatus could be designed for removing the dissolved air, and so reducing the activity of corrosion. The water was allowed to enter a vacuum chamber as a fine spray, and the conclusion which was drawn from the results of the experiments was that the dissolved gases were rapidly removed, very little further advantage being obtained by allowing the water to remain for a long period in the vacuum chamber.

It was therefore possible to devise an apparatus which was capable of passing a very large quantity of water in the form of a fine spray into a chamber from which the gases disengaged were removed by an air pump, and by this means the corrosive activity of the water was enormously decreased.

It is fairly obvious that if corrosion is largely due to the presence of dissolved oxygen in the water, there should be a marked difference in the activity of corrosion in a pipe where a considerable flow takes place, seeing that in the case of still water the dissolved oxygen would tend to become used up, whereas in this case fresh oxygen would be brought along by the water, and the attack would therefore be continually renewed.

It has been found that if a system of distributing mains which have been in use for a long time be examined, the dead ends, where little water circulates, are less corroded than those pipes through which a comparatively large volume passes.

Although it is true that at low velocities the corrosion increases with the velocity of flow, a point is reached when the opposite takes place, and there is a critical velocity at which corrosion reaches a maximum. Messrs. Heyn & Bauer found that with cast-iron the amount of corrosion increased with the velocity of flow until the amount reached eight times that in still water, and that beyond this up to six times the critical velocity the amount of corrosion for a corresponding period remained the same. The corrosion in still water in the case of steel was 1·6 times that of cast iron, but increased less with velocity of flow than it did that of cast iron, so that at a certain velocity the corrosion was less than half that of cast iron, and only a little more than double the rate of steel in still water. Strangely enough, further increase in velocity only reduced the rate of corrosion. The difference in the behaviour of the two metals is interesting, but the explanation is not apparent.

EFFECT OF SEWAGE CONTAMINATION.

It follows from what has been said with regard to this action of the dissolved oxygen that if an impure water is so contaminated with sewage that the free oxygen is used up in the oxidation of organic matter, it should be found that iron does not corrode so rapidly in such contaminated water as it would in pure water, provided that there were no deleterious acid present.

When the London main drainage system was constructed considerable use was made of cast iron to form the intersections of the lining of large confluent sewers. Although these cast-iron plates have been immersed in sewage for over fifty years, they show little sign of corrosion.

The presence of chlorides in the water tends to accelerate corrosion, and from that point of view sewage should be more actively corrosive than fresh water, but the action of the chlorides is dependent on the amount of oxygen present, and the activity of attack is therefore restricted.

Ordinary grease tends to protect the iron by adhering to it, and thus preventing attacks.

Generally speaking, if acids are absent it will be found that iron lasts very well when immersed in sewage.

EFFECT OF SOFT MOORLAND WATERS.

Soft moorland waters are particularly liable to corrode iron pipes. This was formerly attributed to the fact that many of these waters are slightly acid, but corrosion has been found to take place with neutral, and even slightly alkaline, waters.

Hard waters are generally found to be very slightly corrosive, probably due to the deposit in the interior of the pipe of insoluble carbonate of lime brought about by the CO_2 dissolved in the water.

The London water mains are a good example of the protective action of a hard water.

EFFECT OF ALKALIES IN REDUCING CORROSION.

The effect of the addition of alkaline solutions to a corrosive water, such as that from the Mundaring reservoir, which supplies the Australian goldfields, is very well marked. It was found that when 3 grains of caustic soda per gallon had been added the loss by corrosion was reduced to one-thirteenth of that caused by the untreated water. In the report already alluded to this was one of the two protective methods recommended to the Western Australian Government.

The explanation of this action is readily given by the electrolytic theory, seeing that the addition of the alkali would give rise to hydroxyl ions, which would lessen the number of hydrogen ions present, and would therefore tend to arrest corrosion, as it is the hydrogen ions which are responsible directly for the attack on the iron.

EFFECT OF CERTAIN EXTERNAL CONDITIONS IN INCREASING THE TENDENCY TO CORROSION.

Having dealt with some features which modify the corrosive attack on the inside of the main, we have now to consider the external conditions which have been found to lead to rapid corrosion.

External corrosion is very largely dependent on the presence of water, especially if the water be saline. It is well known that sea water is more active in its attacks on cast iron and steel than fresh water. The corrosive activity of salt water is accelerated by the presence of dissolved oxygen, but it can take place even where little or none is present.

The chief salts present in sea water are sodium chloride, magnesium chloride, and magnesium sulphate. All the salts are capable of corroding iron, but whereas the corrosion is arrested in the case of sodium chloride and magnesium sulphate when dissolved air is absent, the attack of magnesium chloride is not dependent on the presence of air. When sea water attacks cast iron the iron disappears to a large extent, leaving the graphite. Probably soluble ferrous chloride is formed, which is washed away, leaving ferrous oxide, carbon, silica, &c.

An analysis made of such altered material showed

that it consisted of 81 per cent of ferrous oxide and 16 per cent of carbon. The specific gravity was only about one-sixth of that of iron. The form was retained, but the material was, of course, quite soft until exposed to the air, when it hardened.

As far back as 1853, Mr. Thomas Duncan described how the cast-iron mains laid at Liverpool deteriorated rapidly in the neighbourhood of the docks where the soil was impregnated with salt. He also noted that the harder qualities of cast-iron did not deteriorate to the same extent as the softer. A considerable number of similar deteriorations have been noted, especially in America.

Ashes and cinders have been found to be particularly destructive to pipes, especially where water is present. This is no doubt due to galvanic action, the iron being "anodic" to the carbon, and will be referred to in more detail later. Clay containing gypsum (calcium sulphate) is also actively corrosive in the presence of water.

A very complete study of the corrosion of cast-iron mains in America has been undertaken by Mr. Marshall R. Pugh, who contributed a paper on the subject to the American Society of Civil Engineers in October, 1914. He deals with a number of cases, and shows how the corrosion of the pipes is dependent not only on salt water, but also on the conditions which influence the amount of dissolved air present in the water, the attacks being most active where conditions favour the presence of dissolved oxygen. Analyses were made of the soil of the salt marshes in the neighbourhood of the pipe at Atlantic City, which showed that the iron of the pipe had been dissolved as ferrous chloride, and had been diffused and deposited as ferrous oxide in the surrounding soil.

Relative Corrodibility of Cast Iron, Wrought Iron and Steel.

Having dealt with the conditions affecting corrosion, the question of the relative corrodibility of wrought iron, steel, and cast iron have now to be considered.

The view is generally held that wrought iron is less corrodible than steel. Pure iron is very slightly corrodible, no doubt owing to the fact that the absence of impurities prevents the setting up of galvanic action. Pure iron is, however, not obtainable commercially.

The experiments which have been carried out, and the statistics which have been collected on the relative corrodibility of the two metals as at present manufactured, are far from being conclusive, though many ancient monuments and relics in wrought iron still in a good state of preservation indicate that the wrought iron of those days was decidedly superior to the modern commercial material.

The iron pillar at Delhi is one of the most interesting relics of ancient India, and is said to date back from the year 912 B.C. This pillar, 50 ft. in height and about 16 in. in diameter, is built up of blooms, weighing about 50 lb. each, welded together. The pillar is remarkably free from rust, though the climate of Delhi is not particularly favourable for the preservation of iron exposed to the atmosphere. The surface of the iron has a bronze-like appearance, and one of the suggestions which has been put forward to account for its remarkable state of preservation is that the iron was forged on a silicious stone anvil, and that some of the silica of the stone entered into combination with the iron, as it is known that silica has a marked influence in resisting corrosion when alloyed with iron.

With regard to the relative merits of cast iron and steel in resisting corrosion, Thwaites' experiments, which are recorded in the Journal of the Iron and Steel Institute, are of great interest. It has long been considered that the relative immunity to corrosion of cast iron was largely due to the foundry skin formed at the point of contact between the molten metal and the silicious sand of the mould. Thwaites therefore tried wrought iron, cast iron, and cast iron when the skin had been removed by planing, and immersed plates of each in foul sea water, clear sea water, foul river water, pure air, and clear river water, and also exposed them to the action of city air and sea air. It may be said that in every case cast iron with the skin intact resisted corrosion much better than either wrought iron or cast iron with the skin removed.

The evidence of experimental investigations is therefore in favour of the generally accepted view that cast iron resists corrosion better than steel, and that this is largely due to the silicious foundry skin affording a certain measure of protection.

Effect of the Chemical Composition of the Iron, and its Influence on Corrosion.

It will now be of interest to consider the effect on corrodibility of the various other elements which exist in commercial steel in combination with iron. Unfortunately, the work carried out in this field is rather incomplete. This is especially the case with regard to carbon, but it appears that it is not the percentage of carbon present in the iron which is important, but the actual molecular arrangement of the carbon.

Carbon appears as graphite, which, again, exists in two forms—either flakes, which separate out at a high temperature, or in a state of fine division. The presence of the flakes of graphite have undoubtedly an influence on corrosion, as they are electro negative to the iron itself; but with this point we are not at present concerned. Carbon also occurs as carbide, or combined carbon, in forms which have been given various names. "Martensite" is the name given to the carbide as it exists in hard steel, and "Perlite" to the form which exists in annealed steel.

Some very interesting experiments have been carried out on the effect of the temperature to which the steel has been raised after quenching on its solubility in dilute sulphuric acid.

A most curious result was obtained which points to the probable existence of another form of carbide, to which the name of "Osmondite" has been given, and which has the property of rendering steel extremely liable to attacks by dilute sulphuric acid. There was very little difference up to an annealing temperature of about 200 deg. Cent., when the carbide was evidently still in the form of "Martinsite." From 200 deg. to 400 deg. annealing temperature the carbide probably gradually changed from "Martensite" to "Osmondite," and for steel annealed to the latter temperature the corrosion in the acid was six times as rapid as for steel annealed to the former temperature.

As the annealing temperature rose still further the corrodibility of the steel became less and less, the carbide passing from the form of "Osmondite" to that of "Perlite," and when the annealing temperature had reached about 700 deg. Cent. the corrodibility of the steel was only about twice as great as for hardened steel, and probably the carbide was almost completely converted into "Perlite" at this temperature, for when the annealing temperature was raised to 900 deg. Cent. very little further change took place. The particular steel experimented with contained 0·95 per cent of carbon.

Experiments were also carried out with mild steel containing 0·07 per cent of carbon, and it is stated by Friend that analogous results were obtained.

The above results are of considerable importance, as will be shown presently when the question of the desirability of annealing to remove strains from the steel is dealt with, and point to the necessity of careful investigations being made of the particular steel to be employed for steel pipes; otherwise the effect of annealing may be to increase the liability to corrosion.

The general conclusion to be drawn from the experiments is that the harder the steel the less liable is it to corrode. Unfortunately, it is not practicable to use hardened steel for the manufacture of pipes, but it would be of great interest to ascertain whether the pipes might not be hardened after manufacture so as to render them less liable to attack.

Welded pipes are now in such general use that a low carbon content is important in order to secure a good welding steel.

From various experiments it would appear that small percentages of chromium and copper are of value in reducing corrosion, though it must be borne in mind that copper may be present in combination with sulphur, in which case it is a most undesirable constituent of steel.

It is important to specify a low manganese content for steel to be employed in water mains, as manganese generally indicates the presence of manganese sulphide, which increases the liability to corrosion.

Nickel has long been known as a valuable adjunct to steel in reducing corrosion, but it is only really effective when present in large quantities, and such a large proportion renders the steel otherwise unsuitable for pipes.

Provided that phosphorus is limited to 1 per cent, its presence in steel for pipes is now considered rather beneficial than otherwise.

Silicon, when alloyed with iron, has a marked preventive action as regards corrosion; if there is 20 per cent present the product is practically incor-

[illegible] while 3 per cent has a marked beneficial effect. Unfortunately, such high percentages render the metal unsuitable for pipes owing to its excessive hardness and brittleness. The silicious skin formed on ordinary cast-iron pipes is probably the explanation of their greater resistance to corrosion. If means could be found to give steel pipes a similar skin an important step towards the solution of the corrosion difficulty would have been made.

The presence of sulphur is always objectionable, as it not only tends to set up galvanic action, but forms sulphuric acid in addition, and it is essential in all cases where the metal is exposed that the sulphur content be kept low.

The effect of chemical composition upon the capacity for resisting corrosion has been briefly dealt with, and it will, perhaps, be of interest to consider how far the process of manufacture affects the corrodibility of metal.

It has long been known that steel which has been subjected to stress is more liable to corrode than unstressed metal, and experiments have been carried out which indicate that the corrodibility is proportional to the stress. It is therefore important to remove the internal stress by careful annealing after manufacture. The temperature to which the pipes are reheated ought only to be decided, however, after careful experiments have been made, because it has been found, as already stated, that there is a critical temperature at which the carbon takes the form of "Osmondite," the presence of which renders the steel extremely liable to corrosion.

ELECTRIC AND GALVANIC ACTION.

In the early days of electric traction considerable damage was brought about by stray currents; but recent Board of Trade regulations afford quite sufficient protection to water mains provided they are kept at least 2 ft. clear of the rails, and that the ground is not impregnated with salt water, in which case it is well to surround the pipes with lime concrete as an additional protection beyond the usual coating mixtures.

Abroad it is well to give the rails a wide berth unless the regulations afford protection equivalent to that given by the Board of Trade at home.

The importance of galvanic action as opposed to that of stray electric currents cannot be too much exaggerated, and when pipes have been destroyed in the manner already described when dealing with the effects of salt water, it is probable that galvanic action has been largely responsible. Most of the elements and compounds associated with iron in either steel, wrought iron or cast iron, including mill scale (oxide of iron) and cinders, are electro-negative to iron—that is to say, in the presence of an electrolyte a current flows from the positive iron to the negative element, and in doing so carries with it ions of iron.

PROTECTIVE MEASURES.

For ordinary cases it has been found that the coating of Dr. Angus Smith's solution is a fairly efficient protection against corrosion. The original mixture consisted of coal tar, tallow, slaked lime, fine resin and coal naphtha, but the mixture used nowadays consists essentially of coal tar and pitch oil in the proportion of 2 to 1 by bulk, and the pipes are dipped in this at nearly boiling temperature after all rust and scale have been removed. There is a possibility that pinhole penetrations caused by air bubbles will impair the coating, and in some instances a second dipping has been specified.

As already pointed out, incrustation is not likely to occur with hard waters, but with moorland waters it is most essential to secure a perfect internal coating, and in the case of the Birkenhead aqueduct, in which all the pipes exceed 18 in. in diameter, an entire recoating of the inside of the pipes with Siderosthen is specified just before the pipes are laid in the trench.

In the special circumstances which give rise to external corrosion, the pipes ought to be carried over the ground. This, of course, is not generally practicable in this country, owing to difficulties arising out of severance of property.

Where cast-iron pipes are laid through marshy ground impregnated with salt water, as on the Birkenhead aqueduct, it has been considered sufficient to serve the pipes with hessian saturated with bitumen as an additional measure of protection. A certain part of this hessian must be left off at the spigot end of the pipes until the joints have been made, and this is made good in the field, as are the many spots in which the wrapping has been damaged in transit.

Hessian wrapping has been generally adopted for the protection of steel pipes, and answers well for small mains, but the difficulties of ensuring an absolutely continuous coating have made it necessary to surround the steel pipes through the salt marshes, previously alluded to, with concrete, except at the flanged joints, which are embedded in a mixture of clay puddle and slaked lime, to facilitate examination of the joints.

Large steel pipes used on certain lengths of the Catskill aqueduct for the supply of New York have been given a 3-in. lining of 2 to 1 Portland cement-mortar, and experiments have shown that even where the mortar has not adhered to the metal the desired protective action has been obtained.

The partial failure of the steel pipe line (previously referred to) supplying the Western Australian goldfields, has been much commented upon, especially by those interested in the sale of cast-iron pipes, and, in spite of many reports on the matter, the facts are not fully known. It is proposed therefore, in concluding this paper, to give a short description of what has taken place, as a practical [illegible] has been laid.

The thickness of the 30-in. diameter lock-jointed steel main varies from ¼ in. to $\frac{5}{16}$ in. in the course of the 350 miles between the Mundaring reservoir and Kalgoorlie. The steel for both the plates and bars [illegible] sample contains 0·173 carbon, 0·035 phosphorus, 0·060 sulphur, 0·432 manganese, and 0·01 silica (per cent).

It is stated that great care was taken to remove mill scale and rust before coating with, for the greater part of the line, a mixture of coal tar and Trinidad asphaltum, and elsewhere with a less efficient compound, "Maltha." Welded steel collars run with lead formed the joints, and the total cost of the pipe line was £2,140,000.

The water is pumped successively through eight pumping stations, but as no balancing tanks were provided at the summits between pumping stations, parts of the main ran partially full, air being drawn in at the air valves, thus setting up a state of affairs extremely likely to promote corrosion.

Pumping tests in January, 1903, showed that the main would deliver 5,600,000 gallons per twenty-four hours with a fall of 2·85 ft. per mile.

The greater part of the main is laid in ground impregnated to a considerable extent with carbonates, sulphates and chlorides of calcium, magnesium and sodium, and before the work was undertaken a commission, consisting of Prof. Unwin, Dr. G. F. Deacon, and Mr. Carruthers, advised that the main should not be laid below ground. It further recommended that the pipe should be dipped twice, which precaution was also omitted.

The water in the main also contained a considerable proportion of salts, of which 25 parts per 100,000 of sodium chloride and 5 parts of magnesium chloride were the most notable.

The first rust hole was found in June, 1905, and up to the end of 1908 the number reached 151, and thenceforward the holes have rapidly increased in number, over 900 having been recorded for the year 1913-14.

The excavation revealed the fact that the pitting occurred when the soil was of a retentive character, so that moisture was present. When it was practicable to leave the pipe exposed, it was simply recoated and supported on timber bearers. When it was found necessary to fill in the trench the pipe was wrapped with tarred hessian.

In 1906 it was observed that the head necessary to pump the water was increasing, due to internal tuberculation, and by the end of 1908, or after about six years, the carrying capacity of the main had fallen off by an amount varying from 13 per cent to 53 per cent for different lengths. It was evident that this was due to the failure of the coating, as when the "Maltha" mixture had been used was just where tuberculation was most pronounced. Some of the pipes had also been distributed alongside the trench many months before they were laid, and this may also have had something to do with it.

The three worst sections were adjacent to each other, and the carrying capacity in these sections had fallen off by amounts varying from 40 per cent to 53 per cent. The "Maltha" mixture had been largely used on these sections, the amount so coated varying from 66 per cent to 75 per cent of each section. The exposure of the pipes before laying on

these particular sections varied from twenty to twenty-four months, which was a longer exposure than for any other portion of the pipe line.

The usual pitting, accompanied by tuberculation, had appeared, but it was found that the pitting was in no case deeper than ¼ in. The tubercules did not project more than about 1½ in., and occurred with greater frequency on the bottom of the pipe.

With regard to external corrosion, we reported in 1909 that, in our opinion, the two factors which had brought about external corrosion were:—

(*a*) The deterioration of the protective coating, and (*b*) the fact that the pipe was laid in trenches when it should have been carried on trestles, so as not to be in contact with the surrounding soil, the soluble salts contained in which give rise to corrosion when moisture is present.

We concurred generally with the remedial measures then being taken, but suggested that where it was necessary to bury the pipes in the ground they should be laid on a cradle of lime concrete, and a layer of slaked lime ½ in. thick should be spread over the top of the pipes.

The recommendations which were made with regard to arresting internal corrosion and tuberculation were as follows:

(1) That measures should be taken to prevent air from entering the mains by the construction of summit level and special receiving tanks.

(2) That an apparatus be established as near the reservoir as possible to de-aërate the water entering the main, and that three grains of lime per gallon be added to the water.

The de-aërating apparatus was fully described and a drawing supplied, together with an estimated cost of dealing with the water, based on actual experiments.

After receiving our report, the Western Australian Government formed a Departmental Committee consisting of certain local engineers and chemists, who were to consider the report and advise the Government thereon. These gentlemen expressed themselves generally in agreement with the recommendations, but stated, "We are of unanimous opinion that the pipe was wisely placed below ground." Although they agreed with the suggestion of protecting the pipe by means of slaked lime when the trench was refilled, this was not done.

They concurred with the view that steps should be taken to keep the main fully charged with water, and agreed with the recommendations for arresting internal tuberculation, but suggested that the lime treatment should first be tried, and if this was not successful that the de-aërating apparatus should be added. The lime treatment was put into operation in October, 1910.

In reference to external corrosion, the second annual report, 1913-14, of the Department of Water Supply, Sewerage and Drainage of the Western Australian Government states (p. 66) that "it will be necessary now to open up the pipes more extensively than hitherto in order to keep them from going beyond repair," which hardly endorses the unanimous views expressed by the local board of experts "that the pipes were wisely placed below ground."

Seeing that the life of this pipe line has been so largely decreased and the annual maintenance so enormously increased, it is not going beyond the mark to put the money thrown away at something like £1,000,000 sterling, for if the Government had taken the advice they were given by the original commission external corrosion would have been negligible.

Turning now to internal corrosion, where the advice given was partially followed it appears that the treatment of the water has been successful and that internal tuberculation has been arrested, the following being quoted from the same annual report:—

"Inspections made lately show that a continuous coating of lime has been formed inside the 30-in. main along the greater part of its length, diminishing gradually in thickness from Mundaring until traces only are found at Kalgoorlie.

"The corrosion and consequent formation of nodules in the main that were going on rapidly a few years ago appear, from the inspection made and from tests of friction in the main, to have been brought almost to rest."

The report contains some interesting photographs showing the interior of the main at different distances from the reservoir, and the effect of the lime treatment.

CORRESPONDENCE.

Ἓν ἀνὴρ οὐ πάντ' ἰᾶται.
(One man does not see everything.)
Euripides

FLIES AND EXCRETA.

To the Editor of The Surveyor

Sir,—In the Ninth Report of the Sewage Disposal Commission, just published, there is a memorandum by Sir William Ramsay dealing with Conservancy methods.

While differing on many points from the views expressed in that memorandum, there is one view expressed on page 188, lin. 32-33, which is absolutely opposed to the experience of all who have made any study of the habits of flies.

The paragraph I allude to runs as follows: "Flies do not settle on fresh excreta, and the latter should always be buried while fresh."

This statement is most misleading, and should not be allowed to pass uncorrected. It is a matter of common knowledge that very many species of flies, including *Domestica*, *Corvina*, and a host of other species revel in fresh excreta. Graham-Smith, in his book on "Flies and Disease," non-blood-sucking flies (Public Health Series, Cambridge University Press), p. 202-203, 1st edition, quotes Nicoll as follows:

"It is a matter of common observation that fresh and moist fæces attract flies much more readily than old and dried fæces. Flies feed on warm, fresh fæces with considerable avidity, and they will do so even although they have been previously feeding on other material. To flies which have not fed for some time the presence of fresh human fæces acts as an immediate source of attraction, and in some of my experiments the eagerness with which they attacked it was most striking. When the portion of fæces was so small that all the flies could not find standing room upon it, or around it, they struggled together and pushed each other aside, and more than once I have seen them so closely packed together that each fly could find room for only the tip of its proboscis, the flies on top practically 'standing on their heads,' supported by the bodies of those around. Their behaviour towards older fæces, however, is very different. When the material has become cold it does not attract flies nearly so readily. So long as it remains moist it continues to attract, and does so quite as much as moist bread, although very much less so than moist sugar. When it has become dry it possesses little or no attraction, but this is increased when it is moistened again. It is evident, therefore, that the presence of moisture plays an important part in a fly's attitude towards fæces as an article of food. When the alternatives of fresh fæces, sugar and bread were offered, the flies did not confine their attention to any one of these articles, but made repeated excursions from one to the other."

Regarding the re-moistening of dried material for feeding purposes, this is frequently done by certain Reduvoid bugs, who pump out saliva for this express purpose.

Economic entomologists are fairly well agreed that, for the extermination of any insect pest, the pest must be attacked at its source, and, preferably, attacked by a parasite. The day of "washes" and "insecticides" has been relegated to the past. For purposes of diminishing the numbers of flies, the maxim of "Swat that fly" is doubtless a beneficial one, in that it may induce elderly gentlemen to take a certain amount of bodily exercise; supposing, however, that *M. domestica* (the house-fly) does not hibernate, and proof is still lacking both ways, then the killing of individual flies reminds one of the advertisement which, it is said, once appeared, offering a certain way of killing fleas, price 6d., post free. The apparatus consisted of two small blocks of wood, and the instructions were as follows: Place one block on the table, put the flea on this block, place the other block on the flea, and press hard!

If flies are to be attacked in earnest, it is pretty safe to assume that their breeding grounds should receive first attention. There is work in connection with the house-fly alone to last two or three lifetimes, and until the public begin to realise the value of genuine scientific research work, and that the labourer is worthy of his hire, so long will the fly problem remain in very much the same condition as it is to-day.—Yours, &c.,

Thothmes

Westminster.

April 19, 1915.

Replanning and Redevelopment in Existing Areas.*

By W. T. LANCASHIRE, A.M.Inst. City Engineer of Leeds.

old areas of towns, clearing of unhealthy areas, &c.; the Metropolis.

for better travelling facilities, and for the clearance expenditure which is involved in their execution. sideration, and in many instances the opportunities dealt with.

development. New by-laws and powers under Private new estates, and many streets and roads have been whole of these street improvements and widenings have been brought about solely with the idea of furnishing better facilities for traffic. There are a few examples where other considerations had some weight in bringing about the alteration, or have materially affected the plans.

standard for first-class streets in the centre of the city has been 75 ft., which allows for a double line for two lines of vehicular traffic between the rails and the kerbs.

It is not a width which commends itself to shop- street in which to conduct their business; but experience in Leeds shows that it is easy to err on the narrow side in this matter, as several streets have been widened twice, and more than one plot of land has been bought, sold, and bought again for street-widening purposes.

and improvement during the last fifty years has amounted to about 2½ millions of money, and the annual charge for sinking fund and interest is respon-

With the object of preventing the frequent breaking up of street surfaces, subways have already been constructed to a length of about 2,177 yds. to accommodate gas, water, electricity and other mains and services, the largest subway being 8 ft. by 7 ft. In dealing with the unhealthy areas and street improvements, it is found that a considerable factor for consideration in replanning and in the cost of developing the areas is the disturbance of the various services of the city—such as the tramways, sewers, elec- other cables and pipes. These services are affected not only by the widening and alteration of lines of thoroughfares, but frequently by modifications in the levels only.

In carrying out street improvements the corporation has not always been in control of the design of the elevation of the buildings erected on to the widened thoroughfares, but within the condemned areas it is, and in all sales in them it reserves the

Where streets are widened parts only of properties are often acquired, and the owner is at liberty to follow his own ideas in rebuilding.

On the untouched side of a widened street the erection of more appropriate buildings is often long delayed, and when it takes place it is without control by the local authority.

The impression gained from the development of the condemned areas and the infirmary scheme is that in some instances it is better to deal with large areas of slum property, and to construct roads through them, than to adopt the alternative of widening existing roads in thoroughfares.

The cost of street widenings in the centre of large towns is very great, as may be seen figures:—

		Width.			
		From	To		
		Feet.	Feet.	£	£
				1,[illegible]	[illegible]
				[illegible]	[illegible]
				[illegible]	[illegible]
				[illegible]	[illegible]
Roseville-road ...		32		15,927	
Cross Stamford-street ...				[illegible]	[illegible]
		12		31,010	

In the unhealthy areas several miles of new wide streets and widened streets have been or will be secured, which, taken at a moderate estimate, would amount to nearly as much as the whole areas have cost.

It is well worth the consideration of municipalities whether it is not advisable to promote schemes which, though they look large on paper, may cost no more, and will certainly do far more to redeem portions of a city than simple street widenings.

The advantage of freedom in laying out a new street over the tied conditions often encountered in street widening is manifest in the matters of lines and levels.

Generally the work of street widening and rebuilding of old areas is very costly, and when one considers the amount it involves in Leeds—i.e., over 1s. 4d. in the £—on assessable value at the present time, and realises that most of this will continue as a charge on the community for many years, one is bound to recognise that further schemes of this description cannot be largely indulged in for some years to come unless the process of carrying them into execution is gradual.

In 1906 the Leeds Corporation decided to drop their powers for carrying out street widenings affecting nearly 3 miles of streets, as the capital cost was so heavy.

These widenings are all necessary ones, and some properties affected by them have been purchased since the compulsory powers were dropped; but the corporation is, of course, handicapped in conducting negotiations with no power behind it.

The lesson to be drawn from this is that it is inadvisable to obtain special powers to acquire a large amount of property in a limited space of time, and that power should be possessed for acquiring it at the discretion of the local authority.

Many corporations possess powers of varying value for defining building lines in old streets, but the process of widening in this manner is open to objection from the public and owners' point of view, as the powers generally are only operative when rebuilding takes place, and affect only the depth of property adjacent to the street. These powers often have to be supplemented by Provisional Orders to put an end to a long-drawn-out process.

The centres of large growing industrial towns are always changing; house property disappears in one way or another, and gives way to manufacturing or business premises which are erected to the old lines of streets. The difficulty of satisfactorily dealing with this gradual change is considerable under present conditions, and often properties and neighbourhoods are made more costly to deal with when the day comes for a further improvement.

The large towns will continue to cover more ground, and the inhabitants will doubtless require that their cities shall be improved as years roll by.

How is this movement to be controlled?

If replanning is dealt with in detail, in small areas at a time, it is easy to miss important considerations which force themselves forward when one is taking a general and comprehensive survey of the whole question.

It therefore appears desirable that each municipality should have its plan indicating the improvements to be carried out as time, opportunity and money allow; but this would have to be a plan to which many would have access. Can this be done

* From a paper read at a meeting of the Town Planning Institute last Friday.

to-day without encouraging the species of speculation which already exists whenever municipalities are supposed to have projects in view? At present it is to be feared the answer must be in the negative.

The advantage of having a plan for the redevelopment of a city would be great. At the present time improvements are often piecemeal, and projects put forward are sometimes cut down to undesirable limits to suit the immediate financial exigencies; the difficulty of carrying numerous schemes through a changing governing body is much greater than would be the case in inducing a council to adopt some comprehensive scheme which would be worked to without undue haste, and as time and money allowed.

A general scheme can be more satisfactorily prepared by calling in all the advisers who ought to appear in such matters than will be the case if the replanning of a big centre is dealt with on piecemeal lines.

It is not suggested that large alterations should be carried into execution at once; it is inadvisable to have too much in hand at one time, or the appearance of a city suffers by reason of the extent of the alterations which are taking place. Sections of street widenings and improvements should be carried through rapidly when once begun, in order that the wounds in the city may heal as quickly as possible, but it ought to be practicable to have schemes in existence for replanning and redevelopment in existing centres, which the local authority should have power to carry out from time to time in detail as occasions may offer and circumstances permit.

PAPER BY MR. H. V. LANCHESTER, F.R.I.B.A.

In a paper contributed by Mr. H. V. Lanchester, F.R.I.B.A., the author directed his remarks more especially towards the preparation of city improvement schemes, and the general principles on which they are framed rather than to the problems that arise when the decision has been arrived at and the work is put in hand. "Though I am aware," he said, "of the difficulties that are felt to lie in the way of a general comprehensive improvement plan, I must still contend for this as against the more usual method of dealing with improvements in isolated instalments."

City improvement, no less than the work of town planning, in the narrower acceptance of the word, demanded the collection of all available information bearing on the problems, and though this might not in every case extend to the preparation of a complete civic survey, it must necessarily follow the lines laid down for such an undertaking.

Alluding to India, Mr. Lanchester said it would probably be some considerable time before the demand for a definite organisation of industry and commerce became an important factor in the improvement scheme. For that reason other considerations took a prior place, predominant among these being health and traffic. Health was, as they knew, intimately connected with housing conditions, overcrowding, density and state of the buildings, character and drainage of soil, and the general standard in respect to sanitary requirements. In many respects the inhabitants of India were cleanly and methodical in their habits; in others, unfortunately, they were quite the reverse, with most disastrous results. Where an area was densely covered by badly built houses plague spread rapidly; but it was checked by open spaces, good roads, and substantial buildings.

Passing on to the traffic question, Mr. Lanchester said he must refer to two factors that had not hitherto been adequately dealt with. One of these was the lack of regulations for sorting out the fast and slow traffic, and directing them, as far as possible, into distinct lines of route; the other was the investigation as to how far the traffic in a busy street was "internal"—that was to say, from one point to another, and therefore incapable of diversion. Statistics on this basis were not easy to obtain, but a great deal might be done by securing a fair general impression of the manner in which such a street was used. Where it was mainly a shopping street there could be no doubt that much of the traffic was of this kind; consequently it would be well to regard such a street, as far as possible, independently from the general provision of traffic routes. In other respects the needs of traffic were beginning to be well understood.

In some remarks on the arrangement of tramway systems the author complained that too often radiating tram routes terminated at three or four different points, and that even those which ran as through lines from one suburb to another did not connect in the centre with other routes. To his mind the ideal method, which, with the improvement of one or two thoroughfares at most, would be feasible in nearly every city, might be termed the central circuit system. With this a route encircling the centre of the town should be selected, and along this all trams would pass in clockwise direction, so that a single line only was needed. "Each of the two track radial routes joins this tangentially to left and right—the left for cars passing on to the central circuit and the right for those coming off it. Thus all cars pass around this centre ring, which should bring them near the railway station or stations and the more important public offices. At all points on the circuit passengers can change from one route to another, and this is also a recognised line on which all cars may be found."

Mr. Lanchester added that the appropriate length for such a central circuit was from ½ mile to 1 mile; if less than the first it would tend to become congested, and if too long it would unduly increase the car mileage.

DISCUSSION.

Mr. Raymond Unwin occupied the chair at the meeting of the Town Planning Institute at which the foregoing papers were read last Friday night, among those present being Messrs. J. W. Cockrill, borough engineer of Great Yarmouth; E. Willis, engineer and surveyor to the Chiswick Urban District Council; H. E. Stilgoe, city engineer of Birmingham; C. F. Wike, city engineer of Sheffield; J. A. Brodie, city engineer of Liverpool; and J. A. Webb, surveyor to the Hendon Rural District Council.

The discussion was opened by Mr. Cockrill, who, in moving a vote of thanks to the authors, showed how the gradual replanning of portions of the town of Yarmouth had contributed to the health of the inhabitants, and in particular had resulted in a material reduction in infantile mortality.

Mr. Stilgoe, seconding the vote of thanks, said that at the present time Mr. Lancashire's particulars with regard to Leeds were especially interesting, because he had just commenced the work of attempting to deal with the central portion of the city of Birmingham. It was a tremendous work to attempt to replan the centre of an old town of any magnitude. He had found that he derived the greatest help by first of all preparing a skeleton map of the city, showing the great radial roads running right out to the extremities of their area and beyond. It was extraordinary that one had to consider roads [illegible] as 7 and 8 or more miles from the centre in relation to the actual centre itself, but that really was, he believed, the first thing one had to do. Then in deciding what the width those roads should be one had to consider what the future traffic was likely to be—that was to say, what means of public conveyance were to be adopted. What they found was that the old main roads running to the centre of the city had a distinct character of their own, and that in many cases if they attempted to widen them they would be not only entirely destroyed from the shopping point of view, but the disturbance of property would entail heavy claims for compensation. In many instances the actual buildings scarcely compared with what one had to pay for trade disturbances. Therefore they had to consider whether it was not more economical, and not only more economical, but more desirable, to cut out a fresh line altogether: and there was no doubt that in very many cases it was more economical to take a straight line through some of the properties—often quite poor and situated a short distance from the main roads. He noticed that Mr. Lancashire had placed the greatest width of street in these improvements at about 75 ft., but he himself had found considerable difficulty in deciding on a figure. In the outer districts one had not the same difficulty, because the expense was a mere nothing compared with what it was in the central area; and in fixing the width of these streets one must consider whether one was going to provide for tramlines in the centre, or bring their minds to the possibility that in all human probability there would in the future be no tram lines in the streets

at all. They knew that the repair and upkeep of tramways was a consideration that unless the carrying capacity was very great the systems had very great difficulty in paying their way. At any rate the presence of tramways in a street must have a great influence on the question of width. If the streets were to be beautified in the centre, the [illegible] anything over 100 ft. and, as was known, thoroughfares of excessive width were not [illegible] It was the medium sized up to about 80 ft. in width which probably touched the limit for the best shopping facilities. Mr. Lan[illegible] had shown them a very interesting lantern of the tramway circle. He did not know, however, whether he looked forward very hopefully to getting that kind of thing. Unless it was of a fair diameter [illegible] the people. The problem [illegible] was a very big one, but the objections [illegible] in his opinion, greatly [illegible] up in the question of the character of the popular [illegible]

Mr. Bigwood remarked that they had in Mr. Lan[illegible] a gentleman who came from a city [illegible] probably more than any other in England [illegible] way of improving [illegible] Glasgow [illegible] spent as much money, though he was not sure about it. The question of shopping streets had been referred to. In Liverpool there was one thoroughfare which was originally the shopping street of the [illegible] the shopping had now, however, left there to a very large extent and property which a little while back was of considerable value had suffered very considerably in consequence. An increase of value had taken place in another street, no portion of which was less than 70 ft. in width, so that affords [illegible] the fashion to say that the proper thing to do was to keep shopping streets narrow, he thought it would be well to keep an eye on the other side. It had been pointed out by Mr. Lancashire that in several cases widenings and improvements had been called for on account of travelling facilities, and he (the speaker) thought that had been so to a very large extent up to the present time. His view, however, was that they must pay more attention to travelling facilities. Travelling facilities must be [illegible] and whether they were tramways or motor 'buses, if they were not going to provide in their streets for [illegible] which would compete with any other mode of travel they would not be able to run their vehicles at a profit. Fast travel facilities were absolutely important, but immediately one got outside the [illegible] centre of the city one had [illegible] consider the people living on the two sides of the main roads. One had to provide means of recreation for the people close to their houses without forcing them to go long distances to public parks. As to widening public streets two or three times, he was glad to see that other cities had had the same experience as Liverpool. He agreed that 80 ft. was a good width for a street in the centre of a city; but, although they might hesitate to widen beyond that, he regarded that width as being on the minimum side in view of the necessity for providing fast travel. He had heard it said that it was better to provide two narrow streets parallel to each other instead of one wide one, but he did not agree with that; it was more advisable to widen sufficiently, or even more than sufficiently, in one thoroughfare, because by doing that they avoided a fresh set of expenses for disturbances by going in for two widenings. A reference had been made to subways. It would be interesting to know whether at Leeds the revenue obtainable from those warranted the expenditure on them, and whether the money that came in from them was going to pay interest and sinking fund. In many cases they were a convenience, but there were many people who did not hold out a hope that they would pay for themselves. In his own town, where he had constructed stormwater sewers which could easily have been subways, he could not induce the companies to contribute towards the expense of increasing the size. He would like to know whether the control of elevations had been really effective. As to the rate charges, did Mr. Lancashire obtain contributions from the tramways towards the relief of the rates in Leeds? Properly handled, he thought the tramway undertaking might be made to help considerably in the widening and improving of main arteries leading to the centre of a town. In their own case they got about £100,000 a year from the tramways, and, curiously enough, that was, on the average, about the amount they spent per annum on road widenings and improvements. On the point [illegible] by the Manchester was proposing, as the tramway authority—not as the public authority—a scheme for the spending of two millions of money on the improvement of a few of the streets in the central area from the point of view of the tramways alone? That seemed an unusually broad view for the tramway undertaking to adopt, but it was one, he thought, that might be well warranted; it might be a step in the right direction, and one that municipal engineers might induce their tramway authorities to follow. There was a point as to whether it was wise to have a town plan for improvements in the central area. Under present conditions he fancied it was a rather dangerous business to show it. At any rate he was not proposing to divulge whatever preparation had been made for widening main thoroughfares in the centre of the town. In India they had a very useful method of taking control of property required for public purposes which might be very well followed in England if one could be quite sure that the publication of the plans in certain cases would not materially increase the cost; but in the meantime he thought it was somewhat unwise to show the plan. The diagram shown by Mr. Lanchester was interesting in many ways, but he did not think it was desirable to lay down any general rule. In Liverpool they had three parallel lines in the centre of the city, and some of their people thought they could make the traffic take a circle in very much the same way, joining up the railway station, and they were even prepared to run the service at a loss. They could not, however, get the people to leave the ordinary lines and go round about the circle. He did not think it would be possible in the case of Liverpool to make people leave streets which were the natural flow of traffic. He had always found it difficult to transfer traffic from one road to another. The only way in which he had been successful in doing it was to improve the surface of certain streets without saying anything about it. That immediately drew the traffic from the streets which one possibly left in none too good a condition in the particular direction one wanted them to travel, and the result was very satisfactory. But they had had some costly experience in Liverpool in the matter of improvements. One could improve and widen streets, and think one was going to increase the value of property, instead of which they decreased it. If one began to interfere with the trade in a particular area, he would suggest taking Mr. Lancashire's advice—make arrangements for rebuilding as quickly as possible, and get the trade back to it without delay.

The vote of thanks was passed, and the authors of the two papers afterwards replied to the points raised in the course of the discussion.

Mr. LANCASHIRE stated that, although levels were not good, it was hoped eventually to introduce a circular road. The subways referred to by Mr. Brodie did not pay for interest and sinking fund, and they found there was considerable reluctance on the part of certain departments to make use of them. As to contributions by the tramways towards the cost of road improvements, it was not until last August that authority was given for that to be done, and the committee objected very strongly to making any payment. They wanted two or three roads widened for short lengths, however, and after discussion it was decided to contribute. He quite agreed as to the difficulty of transferring traffic from one street to another. They might open out parallel roads in the hope that congested roads would be relieved, but found themselves disappointed. On the matter of the depreciation of the value of property, he was also of opinion that unless things were done quickly they ran the risk of spoiling the trade of a street completely.

Crystal Palace Engineering Society.—The "Wilson Premium" for the best paper read before the society (affiliated to the Society of Engineers) during the present session has been awarded by the council to Mr. Kirpa Ram for his paper on "How to Prepare a Sanitation Scheme." Other papers read during the session were "Reinforced Concrete," by Joti Ram Goel, and "The Science and Practice of Photography," by T. J. Boyer. The premium was presented to Mr. Ram by Sir John Jackson, K.C.V.O., LL.D., F.R.S.E., M.P., ASSOC.INST.C.E., on the occasion of the 127th distribution of certificates of the above school on Thursday, the 15th inst., at which he presided.

Some Observations on the Final Report of the Royal Commission on Sewage Disposal.

By GILBERT J. FOWLER, D.Sc., F.I.C.

As long ago as 1896 the present writer made a number of experiments on the purification of effluents by aeration, and concluded that it was not a practical proposition. Recalling the observations then made, however, the ready granulation of colloidal matter with production of a clear supernatant liquid, it is easy to see that the essential phenomena of what is now known as the "activated sludge process" were all there waiting to be applied. Unfortunately, the obsession that the object of sewage purification was the solution or gasification of all the constituents of sewage dominated the mind, and possibly, therefore, altered the whole development of the sewage disposal problem.

Having thus implicated himself equally with others, and the criticism which it seems useful to make in relation to the labours of the Royal Commission will, it is hoped, be understood as being impersonal and without any other object than to facilitate future progress.

After the seven years' work of the Royal Commission, what is, then, briefly the present position of affairs?

Frankly, may it not be summarised by stating that, at considerable expense and trouble, it is now possible, in the majority of cases, to obtain fairly satisfactory effluents, although not infrequently a nuisance is transferred from the river to the air, where it takes the form, not only of smells, but of flies and other noxious insects. The sludge problem is still unsolved, and there is practically no attempt to deal with the really serious question of the economic loss of nitrogen entailed by the water-carriage system and present methods of purification. At the same time no one would suggest that the strenuous labours of the Royal Commission have been wasted. While one can see now that it would have been better if more time had been given to advanced research and less to the collection of data from all and sundry concerning imperfectly understood processes, yet very much has been done.

The burden of red-tape insistence on land treatment has been lifted, much important information has been disseminated, and a certain number of facts have been securely established. In consequence, works of increased efficiency have been constructed in many places.

The researches on estuaries and rivers are probably the most important work done officially by the scientific staff of the commission. Such work is of the greatest interest and value, and cannot well be done by private individuals.

The material results achieved are, however, of less moment than the experience gained. What, then, has hindered progress in the past, and how may mistakes be avoided in the future?

The bars to progress would seem to be in the first place obsessions of various sorts, scientific, professional and administrative; and, secondly, the striving for standardisation, which eventually becomes another name for stagnation.

It may be of interest to consider these in order. An example of scientific obsession, or perhaps rather unscientific obsession, has already been referred to in the persistent endeavour to purify or liquefy the sludge-producing elements in sewage rather than to find out really what occurred under various conditions, and take measures accordingly.

All true scientific research will be found on analysis to consist essentially in removing certain preconceptions from the mind by way of observation, reason and experiment. The faculty for research, while no doubt varying in different individuals, is capable of acquisition by any industrious and honest-minded worker.

One reason why greater advance has not been made in the scientific understanding of sewage disposal is that little attention has been given in our universities and technical schools to scientific research in this direction. In the past at any rate, sewage disposal has been looked upon as largely a matter for engineers, manufacturers and members of district councils, to all of whom the community is greatly indebted, but it is a pity that so much good work has in many cases been based on insecure scientific foundations.

The method of trial and error, beloved by this country in most of its undertakings, no doubt leads to excellent results eventually, but at extravagant cost of time and money.

Among professional obsessions may be noted the apparent difficulty in establishing a right conception of the respective functions of the biochemist and the engineer in relation to the sewage disposal problem.

Both the general public and also some members of the respective professions concerned still fail to realise that the ability to make a few analyses and interpret analytical figures does not constitute an individual as chemist, any more than an engineer is anyone who can make a fair scale drawing, put up a machine, or lay down a little concrete.

A chemist is one who, through training and experience, is able to think chemically and unravel and control the chemical factors of a situation. The qualifications of a chemist competent to deal with sewage disposal problems have to be exceedingly wide if, indeed, it may not be necessary at times to call in the assistance of the biologist, using this term in the broadest sense.

The qualifications of an engineer it may be wise to leave to a member of that profession to define, but the power of readily adapting means to ends is surely among them.

In the mutual respect and understanding and loyal co-operation of these two great professions lies the hope of future progress, not only in the field of sewage purification, but in the vast possibilities of chemical industry.

The administrative obsession is one which needs careful watching to avoid uncorrelated individual effort on the one hand and cast-iron bureaucracy on the other.

When urging, ten years ago, a department of research, the answer given was that it was contrary to the genius of the English people. However, the Royal Commission do recommend the formation of a central authority, part of whose function would be investigation. It is to be earnestly hoped that, in some form or other, this proposal will be carried out.

There are many important inquiries which involve considerable expenditure, and which cannot easily, if at all, be undertaken by individuals or municipalities. The study of rivers and estuaries already referred to is such a matter, and large and extended investigations of the possibilities of sludge utilisation, either for agriculture or otherwise, can best be dealt with by such a central body supported by the Government. Such a department might very helpfully publish periodical reports, giving an account, not only of their own work, but summarising important investigations at home and abroad, so that all those interested in the subject would be kept in touch with new developments.

Similar work is already done, in its own sphere, by the Board of Agriculture and Fisheries.

The very interesting section of the Ninth Report of the Royal Commission dealing with the disposal of liquid and solid domestic refuse in rural areas offers an illustration of the dangers of all three obsessions which have been referred to. Statistics show the benefit of the water-carriage system to large towns: therefore, it is assumed, it must be better for country districts. The water and sewage engineer forgets that under certain circumstances apparently primitive methods may be really as scientific as expensive modern equipment, while equally sanitary and much more economical from the point of view of agriculture. Sundry by-laws, local and Governmental, discourage effort on the part of the individual and the local community.

The central authority should be able sympathetically to consider the cases of many of these rural areas strictly on their merits.

The question of standardisation is another form of obsession which, indeed, is to be found not only in the field of sewage disposal, but throughout British industry and commerce.

The Surveyor
And Municipal and County Engineer.

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standards. But to all those who have practically to some time ago to the Association of Municipal Corporations on this matter. We must recognise that in practice we have to deal, as it were, with a continuous curve, and to take half-a-dozen points on it for our standards is a very crude approximation to the facts of the situation.

The only real standard is complete purification without nuisance and with full regard to economy. To commission suggest for their standards, is like allowing the milkman, under stress of circumstances, to continue that permission when the necessity for it

The suggestion of Dr. Wilson, of the West Riding Rivers Board, that every town and manufacturer should adopt the "best practical and available means" for purifying their sewage or effluent would meet the case fully, provided there were an unbiassed authority to state what such means were.

trouble. The Local Government Board issues so-called regulations based on the commission's findings; the engineer who designs the works and the inspector who passes the designs, both are saved trouble. The manufacturer of appliances such as sewage sprinklers, &c., knows what is called for, and finds a market accordingly, and all seems to go well; but eventually all these short cuts and methods for evading the necessity of original thinking stultify progress, and when new conditions have to be faced, a dead weight of inertia of various kinds is built up.

This article has to do primarily with the question of sewage disposal, but the writer's conclusions, he believes, have a bearing on wider issues affecting the national life.

It is being more and more clearly recognised that in many directions there is call for greater efficiency and scientific knowledge. In the field of sewage disposal this country has so far taken an honourable and leading position. Let us beware of settling down to the comfortable belief that the Royal Commission has reported, and all is now well.

Wearmouth Bridge Improvement.—The Committee of the House of Lords have decided that the Wearmouth Bridge Improvement Bill, promoted by the Sunderland Corporation, shall proceed, with certain modifications.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Are Engineers to be congratulated on having had the opportunity of listening to the excellent paper on "Corrosion of Iron and Steel," which Mr. W. J. E. Binnie read at their meeting on the 14th inst.? Was not the paper a thoroughly learned and, at the same time, practical exposition of some of the causes of this besetting evil to iron and steel pipes, and as to the remedies which might be applied?

* * *

Was it not also rather interesting to hear that eminent chemist Dr. Bertram Blount, in the discussion which followed, render a tribute to the courage of engineers and others for employing such perishable articles as iron and steel in constructive work? When he stated that from the moment of manufacture these materials began to deteriorate and perish, did he realise that this is the case apparently with everything in Nature? Who was it who stated that "directly a man is born into the world he begins to die"? And is this not a fact?

* * *

Was the council of the Institution of Civil Engineers awakened to their responsibilities with regard to the charges to be made for professional services rendered by their members by the action of the Association of Consulting Engineers, who have recently dealt with this matter, or was it a mere coincidence? Would not all members of the engineering profession, whether members or not of the Institution of Civil Engineers, welcome a few more "activities" on the part of the council of that body?

* * *

When irresponsible people grumble at the state of some of our roads, which lately have suffered from abnormal weather conditions and extraordinary traffic due to military operations, do they reflect that the roads would have been in a much worse condition if they had been used for military operations by an invading enemy? Should not everyone in this country, instead of spending their time grumbling, do their level best to bring the war to a close by defeating our enemies as speedily as possible?

* * *

Apropos of the above, are there not many engineers over the military age who could join the engineering unit of the National Guard, which has recently been formed, and thus give practical and real assistance to their country?

* * *

Is it a fact that the Roads Improvement Association is considering the question of changing its name to that of "The Roads and Road Traffic Association"? And does it not seem a pity that this well-established body should seek thus to hide its identity after an existence of nearly thirty years?

* * *

Does not the appearance of the huge, unwieldy tramcar in the middle of the ordinary traffic of a crowded street make one wonder as to what would be the effect of an ironclad battleship at Henley Regatta, or an elephant at the Derby?

* * *

Why was it that the Royal Commission on Sewage Disposal did not utterly condemn the dry "interception" processes for dealing with sewage? What could they have been thinking of when it is known that flies are such a serious source of danger, and that any of the disgusting dry systems are not only crude, but a menace to health? Why was not Dr. Boobyer, the medical officer of health of Nottingham, consulted before the report was issued, as he has always something to say in his annual reports condemnatory of the dry systems?

Refuse Removal Difficulties in London.—At Camberwell Borough Council on Wednesday it was reported that the Local Government Board had replied with regard to the council's recent complaint as to the difficulties experienced in conveying refuse out of the borough. The board stated that they had made inquiry at the offices of the Railway Management Committee and suggested that if there is at any time urgent need of railway trucks for the removal of refuse the council should themselves communicate with the committee, addressing the letter to the secretary, 35 Parliament-street, S.W.

Law Notes.

Edited by J. B. Reignier Conder, 57 Moorgate-street, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer, and questions are limited to the practice of engineers and surveyors in local authorities' Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor, at the office of The Surveyor, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion queriers are requested to use distinctive words as noms de plume. The letter X., combinations such as X Y Z., and words such as "engineer" and "surveyor," should never be used.

Water Supply—Recovery of Water-rates.—"W. J." writes: The water supply in this town is under the control of the corporation, the waterworks being their property. All water rates are collected on behalf of the corporation, the charges being based on a scale laid down by them. The charge for domestic purposes varies with the assessment. A short time ago it was found necessary to revise the whole system of collection, and it was found that many people were considerably in arrears. My council are now considering the question of these arrears, and have practically decided to sue for them if not paid by a certain date. I have learnt that it may be contended that these charges are a rent and not a rate, and therefore the council cannot sue unless they can produce a proper agreement. I understand that this contention is based on legal advice. The points I should like to raise are as follows: (1) Can a charge of this kind, vary as it does, according to assessment, be regarded as a rent? (2) What is the difference between a rent and a rate in this connection? (3) Has the fact that on all printed matter the words "water-rate" are used any bearing on the matter? (4) Under what circumstances would it be necessary to have an agreement for a supply for domestic purposes only?

1 and 2. Sec. 26 of the Public Health Act, 1875, empowers a local authority who supply water to do two things, viz.: (1) To charge a water rate assessed on the net annual value of the premises; and (2) to enter into agreements with consumers for the supply of water on special terms, with the same powers for recovering "water rents or other payments accruing under such agreements" as they have for recovering water rates. The Act uses the term "water rents" for the charges payable under such agreements in distinction to "water rates" chargeable without any agreement. It is clear that rates can be recovered without an agreement, and that they are not rents. Rates are recoverable under sec. 74 of the Waterworks Clauses Act, 1847, and sec. 23 of the Waterworks Clauses Act, 1863. The suggested contention is therefore groundless. 3. This does not appear to be material. 4. Only in the case of a supply by meter or on special terms.

"Notice in Writing."—"E. M." writes: I shall be glad if you will say whether the following, put on a plan by means of a rubber stamp, is sufficient "notice in writing" within the meaning of sec. 15 of the Public Health Acts Amendment Act, 1907:—

> NOTE.—THE DEPOSIT OF THIS PLAN IS OF NO EFFECT UNLESS THE WORK TO WHICH IT RELATES IS COMMENCED WITHIN THREE YEARS FROM THE ABOVE DATE OF APPROVAL.

Yes. By sec. 20 of the Interpretation Act, 1889, in every Act expressions referring to writing (unless the contrary intention appears) are to be construed as including references to printing, lithography, photography, and other modes of representing or reproducing words in a visible form.

Construction of New Street.—"Seaside" writes: An owner of land submits plans for a new street which are duly approved by the borough council, and proceeds to lay out the street. He, however, omits to construct the street as required by the by-laws relating to new streets, only laying a sewer and putting down a 12-in. by 6-in. kerb on one side of the street only. He proceeds to sell off all the plots of land fronting the new street, and these are now practically all built upon. He informs me in writing that the street is now completed, but that, having sold all the plots, he has no further concern in it. I have duly notified him, in accordance with By-law No. 101, of his omissions, which I have required him to execute within a month. In the probable event of his making default in compliance, what powers can my council exercise against him to compel the completion of the construction of the street as shown on the approved plans?

This is rather a difficult question, for the following reasons. The "laying out" of a new street and the "construction" of a new street are treated in the by-laws as two separate and distinct operations, and there does not appear to be any by-law making it compulsory for the person who lays out a new street to "construct" the street also. Therefore it would appear that unless this owner has "constructed" the street, he is not bound to comply with the requirements as to construction, and the question is whether what he has done to the street amounts to "constructing" it, so as to bring him within the by-laws as to constructing, notwithstanding the fact that the construction is incomplete. I can find no case or authority throwing any light upon the subject, and I think it is doubtful, in the circumstances, whether the council would succeed in establishing a contravention of the by-laws. If they decide to test the question they can take proceedings to recover penalties (on the expiration of the notices, or, on obtaining the concurrence of the Attorney-General, they can bring an action in the High Court for an injunction to enforce compliance with the by-laws.

TAR-SPRAYING IN NUNEATON.

In his annual report the borough engineer, Mr. E. C. Cook, Assoc.M.Inst.C.E., states that the length of roads tar-sprayed in Nuneaton during 1914 was nearly 18 miles, as compared with 14¼ miles in the previous year and 11⅞ miles in 1912. In addition, nearly 3 miles were sprayed a second time. The total expenditure on tar-spraying (allowing 5 per cent for supervision and plant) was £1,093, and the cost worked out at 1·01d. per square yard, against 1·08d. in 1913, and ·97d. in each of the two previous years.

Mr. Cook mentions that up to the present crude tar has been entirely relied upon; but a contract has now been entered into with the gas company by which they have undertaken to put down a dehydrating plant conditionally upon the council agreeing to purchase a minimum quantity of 300 tons per annum, at a specified price. The arrangement is regarded as a favourable one, from the point of view of the corporation, and is expected to give improved results in working.

Waterproofing of Concrete.—On the flat roofs for the factories of a large glass manufacturer at Rotherham the architect specified a waterproofed concrete as a finishing coat. We understand that the work is very satisfactory. The makers of the waterproofing powder Pudlo, which was used for this work, state that some very important contracts are being roofed with waterproofed concrete.

Motor Lorries and Road Repairs.—Asked in the House of Commons on Tuesday whether, having regard to the damage done to public roads by motor lorries, he would, in the forthcoming Budget, increase the tax on these vehicles in order that the owners should thereby make a more equitable contribution towards the repair of the damage than is at present the case, Mr. Lloyd George said he feared he was unable to anticipate his Financial Statement.

The Treasury and Road Grants.—The following resolution was, on the proposition of the Earl of St. Aldwyn, passed unanimously by the Gloucestershire County Council on Monday last: "That this council protests against the requirements of the Treasury that the Road Board should make it a condition of a grant towards the improvement of certain roads that they should be satisfied as to the adequate maintenance of other roads towards which they have made no grants. That the Road Board grant of 1915-16 towards the scheme previously sanctioned by the Road Board for the use of improved materials upon the more important main roads in the county ought not to be largely reduced in order to relieve Parliamentary votes for war purposes at the cost of the road improvement fund from the charge of repairing roads destroyed by military traffic."

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, 31 Bride's House, 24 Bride lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

The following [illegible] have been chosen [illegible] in respect of the March premium:

Mr. BERNARD KNIGHT, Newport, Mon.—Merriman and Brook's "Text-book on Roofs and Bridges," Part III., Bridge Design (Chapman & Hall).

Mr. M. F. ROBERTS, Rhyl.—"Structural Essentials," E. A. Sealy; "Bridges," Prec. Langford; "Calculations in Hydraulic Engineering," Part II., Claxton Fidler (Longmans).

QUESTIONS.

This week answers are invited to the following questions:—

471. Building Construction.—What is a "chase"? Explain its function, and give sketches in elevation and section. (M. T. R., *Rhyl.*)

473. Retaining Wall. Explain carefully the different ways in which a concrete retaining wall may fail, and state how such failures can be prevented. (M. T. R., *Rhyl.*)

474. Roof Truss. What one end of a [illegible] truss is supported on a roller bearing, what provision is made to counteract the movement and to prevent damage to the slates and timber? How would any movement of the truss affect the covering? How much will a 50-ft. span roof [illegible] movement? ("Square.")

475. Hydraulics.—A pipe 5 in. in diameter delivers a certain quantity of water per minute with a loss of head of 4 ft. Determine the loss of head if the same quantity is delivered through a pipe 4 in. and another 6 in. using the same coefficient of friction.

476. Vectors. State the essential properties of vector quantities, and distinguish between "vectors" and "scalars," giving two examples of each.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

466. Road Making. Describe a few simple tests that will enable an engineer to ascertain the quality of the bitumen and filler to be used in a bituminous macadam road. (Essex.)

The following reply is based on Chapter III. of Mr. J. Walker Smith's work on "Dustless Road Tar-macadam":—

The properties of the matrix of a bituminous macadam road which should be known are volatility, viscosity, power of adhesion to aggregate, and specific gravity. To these must be added the determination of free carbon and the amount of distillate at various temperatures.

(1) *Volatility.*—Samples should be taken and placed, in layers of $\frac{3}{8}$ in. in thickness, and not more, into open dishes and exposed to a temperature of 60 deg. Fahr. for one week, when the percentage of loss by volatilisation should be ascertained, and should not exceed 1½ per cent for a "heavy" or 2 per cent for a "moderate" tar. The residue from this test should then be exposed to a temperature of 110 deg. Fahr. for one week, and the loss again recorded. This should not exceed 3½ per cent for a "heavy" or 8 per cent for a "moderate" tar.

(2) *Viscosity.*—Samples should be taken and put into small tins about 2½ in. diameter by 1½ in. deep. These should then be placed in water contained in a tin tray about 14 in. by 14 in. by 2 in. deep, the water being heated by means of a Bunsen burner. To prevent uneven heating the burner should be kept continually moving over the entire area of the tray bottom, and the water continually stirred. Water lost by evaporation should be constantly replenished, so that the same level is retained in the tray. Observations are then taken at temperatures of 62 deg., 78 deg., 90 deg., 110 deg. and 150 deg. Fahr. A [illegible] temperatures a circular copper disc, 1 in. in diameter and 5·715 grammes in weight, is laid flat upon the surface of the tar and the time required for the complete covering of the disc by the tar is recorded. For [illegible] 110 deg. to [illegible] [illegible] [illegible]

also by the size of the perforations. These vary according to the length of the pipe. They might commence with ⅛-in. diameter and extend up to ¼-in. The number and size of the holes are worked out mechanically in accordance with the number of gallons we want to distribute per square yard, based on the maximum quantity required upon any given yard, and whether that yard is close to the centre or at the extremity of the pipe the distribution per square yard is equal."

Further information may be found in the book above referred to, or in vol. 2 of Moore and Silcock's "Sanitary Engineering."

The following was the method used in the original calculations for distributor arms, for the parties who exploited the invention of Mr. Thos. Cairnk, the city engineer of Worcester:—

Single sprinkler arm, 50 ft. long, to distribute 500 gallons per square yard per twenty-four hours with effective head of 6 in.

Area of bed = ·7854 × 100² = 7854 sq. ft. = 872·66 sq. yds.

∴ Quantity to be distributed = 436,333 galls. per 24 hrs.

5·05 galls per second = ·808 cub. ft. per second

Velocity of flow = 8·025 × $\sqrt{H}$ = 8·025 × $\sqrt{\frac{1}{2}}$ = 5·7 ft. per second

Allowing coefficient of ·62 for flow through jet hole actual velocity = ·62 × 5·7 = 3·5 ft. per second

$$Q = VA$$

$$\therefore \cdot 808 = 3{\cdot}5\ A$$

$$\therefore \text{Total area of holes} = \frac{\cdot 808}{3{\cdot}5} \text{ sq. ft.} = \cdot 231 = 33{\cdot}26 \text{ sq. in.}$$

Allowing an equal spacing of 6 in. apart, the number of holes would be 100.

If the area of the first hole is found, the second hole would be double that area, the third hole treble, and so on, in order to give equal distribution with equal spacing.

The total area of holes is therefore the sum of an arithmetical progression having the area of the first hole as both the first number of the series as also the common difference—*i.e.*, $a = d$ in equation.

$$s = \frac{n}{2}\left\{2a + (n-1)d\right\}$$

$$\therefore 33{\cdot}26 = \frac{100}{2}\left\{2a + 99a\right\} = 55 \cdot 101a$$

$$\therefore a = \frac{33{\cdot}26}{55 \cdot 101} = \cdot 0066 \text{ sq. in.}$$

The following table therefore gives particulars of the holes:

No. of hole	Area of hole in square inches.	Diameter of hole in inches.
1st	·0066	·9
2nd	·0132	·13
3rd	·0198	·16
4th	·0264	·18
24th	·132	·41
50th	·33	·65
100th	·66	·92

In practice there may be two or four arms, and the pitch as well as the size of holes usually varies, but proper distribution to the required amount can be calculated on the above principle.

In the earlier forms of the Candy-Cairnk sprinklers the equal distribution was obtained, as above explained, by varying the size of the jets and maintaining equal spacings between them, the areas of the jets varying directly as their distances from the centre of the sprinkler—that is, directly as their lineal speed of revolution.

But in the most recent forms of these sprinklers the equal distribution is secured by the more convenient method of preserving the same size of jets and varying their distances apart.

The spaces separating the jets vary inversely as their distances from the centre.

This method is rendered practicable by the application to the sprinklers of patent spreading jets which deliver the liquid in a wide spray, covering the entire area between the spaces, and not in single isolated streams as is the case from the ordinary jet.

Shanghai Municipal Buildings.—At a meeting of [illegible] March 22nd, it was unanimously decided to adopt natural stone facing for the new municipal buildings. The original contract was for artificial stone. The extra cost will amount to £32,000.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Clacton T.C. (April 13th. Mr. P. M. Crosthwaite). £10,450 for works of sea defence and electricity. Evidence was given as to the necessity for both of the proposed schemes.

Cork R.D.C. (April 10th and 12th. Mr. C. H. Deane).—£120,000 for a scheme of improvements, including the erection of a large number of workmen's cottages.—The inspector was engaged for a considerable part of the time in hearing evidence for and against the eligibility of applicants for the occupancy of cottages.

Croydon T.C. (April 21st. Mr. G. L. Pepler).—This was an inquiry into an application for permission to prepare a town planning scheme in reference to the area in the northern part of the borough known as the Beulah-hill district, about 800 acres in extent.—Mr. H. Conacher, barrister, appeared for the Ecclesiastical Commissioners, who own about 150 acres of the land. He said they did not wish to be included in the scheme, as they were already putting into operation a town planning scheme, and were willing to meet the corporation in any way.

Newmill U.D.C. (March 25th. Mr. F. O. Stanford).—£5,200 for works of water supply, including the construction of a reservoir of 1,500,000 gallons capacity at Hade Edge.—The surveyor, Mr. F. Boothroyd, stated that the present supply was derived from the Magnum drift, the Gooseholes drift, and Bankhouse, the storage accommodation comprising a small tank at Gooseholes and a small reserve at Bankhouse. Scarcity arose in 1912-13.

Nottingham T.C. (April 21st. Mr. Raymond Unwin).—This was an inquiry into an application for authority to prepare a scheme of town planning for some 600 acres of land lying between Mansfield-road and Nottingham-road.—The town clerk (Mr. W. J. Board) said the land was undeveloped, save for a hosiery factory and a few cottages, which would not interfere with the scheme. It was proposed to have a main arterial road, probably 80 ft. wide, running along the Day Brook, and a 60-ft. road along the bridle path to the south of the prison. Land would be reserved for a recreation ground or grounds and other public purposes, and Edward's-lane, part of Hucknall-road, and part of Nottingham-road would be widened. With the exception of the railway companies, no objection had been raised by the owners of the land.

APPLICATIONS FOR LOANS.

Audley U.D.C.—£1,200 for works of sewerage.

Lowestoft T.C.—£3,000 for works of drainage.

Pembroke T.C. £1,000 for the purpose of drainage works.

Prestwich U.D.C. £325 in connection with the town planning scheme.

Warwick T.C.—£700 for works of water supply.

Worcester T.C.—£1,967 for works of sewerage.

LOANS SANCTIONED.

Hendon U.D.C. £27,750 for main [illegible] works.

Okehampton T.C.—£106 for works of water supply to East street.

Walsall T.C. £16,700 in connection with the electricity undertaking.

FORTHCOMING INQUIRIES.

APRIL.

		£
27.	**Budleigh Salterton.** For works of water supply (Mr. W. O. E. Meade-King) ...	700
27.	**Torrington.** For the [illegible] (Mr. H. A. Chapman)	450
28.	**Bradfield.** For works of water supply (Mr. R. H. Bicknell)	900
	TOWN PLANNING.	
29.	**Little Hulton.** (Mr. Raymond Unwin)	

The L.C.C. and Heavy Motor Traffic.—A movement [illegible] a conference of road authorities with a view to definite action being taken to mitigate the nuisance caused by the vibration of heavy motor cars and road locomotives.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings, Bristol; [illegible], Middlesbrough; housing and town planning, Cardiff; Saltcoats; roads and materials, Harrogate, Norfolk, Swansea and Neath; sewerage and sewage disposal, Essex, Rochford; water supply, Derby, Penrith; and other municipal works will be found on our "Local Government Board Inquiries" page.

ADMINISTRATION.

Swansea T.C.—The council have approved in principle proposals made by the Borough Surveyor, Mr. J. R. Hosier, for the reorganisation of the Highways Department, the object of the scheme being to [illegible] two men with the Colours, and the appointment of a junior and a boy clerk.

BUILDINGS.

Abergavenny T.C.—A covered shelter is to be built [illegible] at a cost of £180.

Banff C.C.—A report on the reconstruction of the Northern Bridge, at an estimated cost of £1,451, [illegible] has been submitted to the Road Department [illegible] committee for consideration.

Bristol T.C.—The Local Government Board have intimated their approval of the plans for the enlargement of the hospital at Nover's Hill.

Esher and the Dittons U.D.C.—The tender of Messrs. Dorman, Long & Co., at £1,105, has been accepted for the supply and erection of steel girders for the Hare-lane Bridge. The workmen are to receive [illegible] 2s. 6d. per week [illegible] to accept additional employment and [illegible] each.

Hampton U.D.C.—The question of the proposed open-air swimming bath is to be deferred, owing to the increased cost of materials and the lack of skilled labour.

Ilford U.D.C.—The surveyor, Mr. H. Shaw, has prepared a sketch [illegible] a proposed [illegible] Farm.

Maldens and Coombe U.D.C.—The council are to contribute half the cost, estimated at £80, of the reconstruction of the bridge over the Beverley Brook at Burlington-road. The Local Government Board have declined to sanction the proposed grant by the council of £25 to the Malden Athletes' Volunteer Corps for a rifle range, stating their view that the expenses of voluntary bodies should be met by voluntary subscriptions rather than from public funds.

Middlesbrough T.C.—The design of Mr. J. Forbes, of Middlesbrough, has been selected for the proposed new William Fallowes School at Grove Hill.

HOUSING AND TOWN PLANNING.

Arklow U.D.C.—The council have taken up a loan of £1,100 for working-class cottages.

Atherstone R.D.C.—It has been decided to submit to the Local Government Board a scheme for providing additional housing accommodation.

Baldock U.D.C.—The surveyor, Mr. P. Kent, has prepared plans for two houses.

Bangor T.C.—It has been resolved to build twenty-four working-class houses on the Sackville-road site.

Cardiff T.C.—A deputation that interviewed the Public Works Committee on the subject were informed that the borough engineer, Mr. W. Harpur, had the subject of town planning in hand, and that if the war had not intervened the council would probably have embarked on a scheme before now. A subcommittee was appointed to go into the matter and report.

Chesterfield T.C.—The borough surveyor, Mr. Vincent Smith, has received instructions to prepare a housing scheme, the houses to be let at from 5s. to 5s. 6d. per week.

Coleraine R.D.C.—The clerk on Saturday reported that the council's new scheme for the erection of additional labourers' cottages was now complete. The total amount of the loan, he said, was £9,636. A memorial asking the Local Government Board's [illegible] to the scheme [illegible].

Downham U.D.C.—A communication has been received from the Local Government Board asking for the details as to the increased price of building materials, and stating that they saw no reason why the council should not prepare a housing scheme to [illegible] to the Local Government Board for their approval. The council agreed to refer the matter to the Housing Committee.

Enniskillen U.D.C.—A proposition has been carried to build thirty-two workmen's houses.

Menai Bridge U.D.C.—On the recommendation of the General Purposes Committee, the council have resolved to apply to the Local Government Board for its consent to the appropriation of 195 sq. yds. of land at New-street, under the Act of 1890, for the purposes of workmen's cottages.

Scarborough T.C.—It has been decided to proceed with housing schemes in the east and central wards [illegible].

PARKS AND OPEN SPACES.

Govan T.C.—It has been agreed to purchase a site [illegible] as a new open space.

REFUSE COLLECTION AND DISPOSAL.

Consett U.D.C.—The surveyor, Mr. F. Hargreaves, has submitted a report advising against the use of motors for refuse removal under existing conditions, because of the continuous short stops, while there was no convenient centre to which refuse could be carted for loading on to the motor without creating a nuisance. With respect to the possibility of improving the middens, and thus getting rid of the drawback of having to remove wet refuse, he suggested that the council should exercise their powers under the Public Health Amendment Act, 1907, and assist the owners half-way by, say, laying the drain and contributing £1 per midden altered. If by this means they got the 100 middens which are collecting the most subsoil altered quickly, they would, in a very short time, save the expenditure in reduced working costs. If, however, the council decided generally to adopt the dry refuse system, he was of opinion that, viewed entirely as a business proposition, it would pay the council well, as to effect a saving of over £200 per annum it would only take an expenditure of £1,700. He believed it would then be possible to reduce the cost of house refuse removal further, as the use of motor haulage would become practicable.

Plymouth T.C.—The council have confirmed the minute of the Works Committee to make a charge of 2s. 6d. per load for collecting and removing trade refuse.

Ramsbottom U.D.C.—In a report with respect to the refuse destructor, brought into use a little over a year ago, it is stated that the actual cost per ton of refuse destroyed was 1s. 5½d. The sinking fund and interest charges work out at 2s. 5d., making a total of 3s. 10½d. per ton.

ROADS AND MATERIALS.

Cork T.C.—The Road Board, in a communication, state that as the proposed improvements on the Lower Glanmire-road and Western-road are of a most urgent and pressing character, application will be made to the Treasury for their approval to the proposed advance of £1,000 towards the work, and when this is received the grant will be forwarded.

Cornwall C.C.—With respect to applications for grants for works of road improvement, the county surveyor reported that the secretary to the Road Board had written that the board proposed to make grants towards the cost of road crust improvements which were immediately required, but that unless special circumstances could be shown such grants would be on a considerably reduced scale, and would only be made in the case of important roads. Later, Mr. Maybury, manager and engineer to the Road Board, informed him (the surveyor) that the Treasury had been disinclined to allow them to make any grants at all, but the board had induced them

to relax to a certain extent, and he thought they might be able to offer £3,500 to Cornwall, and would leave the selection of works to the Main Roads Committee. He (Mr. Maybury) was not prepared to recommend any grant towards tar-spraying, excepting where there were very special reasons for doing such work. The total of grants for 1914-15 was £13,039, including £2,128 for tar-spraying.—The council agreed that unless the Road Board made a grant towards tar-spraying the county occupied the same position as the Road Board, and would not make any contribution out of the county funds. The council have sanctioned a scheme for the repair of the road from Penzance to St. Just, at an estimated cost of £1,500.

Croydon T.C.—An improvement is to be carried out in Cherry Orchard-road, with the object, among others, of removing the dangerous corner at Hall & Co.'s Wharf, and making the thoroughfare 50 ft. wide.

Derry C.C. The council on Saturday decided to provide motor cycles for their assistant surveyors, the county surveyor to get estimates of the cost. The council also voted a sum of £20 per annum to each surveyor towards the maintenance and upkeep of the machines, provided they satisfied the county surveyor that they had expended at least that sum on running and maintenance.

East Grinstead R.D.C. The council have accepted the following tenders for the hire of horse and man to work the water cart with the steam roller:—Forest Row parish, Mr. G. Williams, 6s. per day; Hartfield parish, north of railway, Mr. S. J. Cole, 6s. per day; Withyham, north of railway, Mr. S. J. Cole, 6s. per day; Worth, Mr. T. Worsell, 5s. 6d. per day; West Hoathly, Mr. Geo. Williams, 6s. per day.

Halesworth U.D.C. With a view to reducing the cost of street watering, it has been decided to surface-tar all streets hitherto watered.

Hayes U.D.C.—The surveyor, Mr. D. C. Fidler, has prepared a plan and estimate for the widening and repair of Yeading-lane.

Hendon U.D.C. Plans and estimates have been completed for the widening of Finchley-lane, at an estimated cost of £4,019. Private street improvements, estimated to cost £19,042, are also under consideration.

Keynsham R.D.C. The county council have authorised the surface tarring of a total length of 3,710 yds., containing an area of 23,692 sq. yds. of the main roads, at the rate of 1·75d. per super. yard. The county council have also authorised the surface tarring of the Bath and Bristol road for a length of 11,964 yds., containing an area of 40,452 sq. yds. The highway surveyor, Mr. J. Johnson, said he had been requested by the county surveyor to prepare a statement of the additional cost incurred in maintaining the London, Bath and Bristol road, owing to military traffic. The county surveyor and he both agreed that no damage of a serious nature had been done to that road, and the extra cost, amounting to £149, was for surface damage only. Undoubtedly considerable damage would have been done had not careful attention been paid to the work of strengthening weak sections of the road with good, sound material during recent years, and that undoubtedly accounted for the road standing so well. The council, he added, would be interested to know that theirs was the only district in which Road Board work would be carried on this year.

Norfolk C.C. The council have approved of a number of schemes prepared by the county surveyor, Mr. T. H. B. Heslop, and have agreed to make application to the Road Board for a grant, and that if such grant be given the work be proceeded with, provided the Road Board are willing to grant the amount, which is estimated at £9,000. In the event of their only agreeing to make a smaller grant the scheme is subject to reduction accordingly. Part I. To convert existing granite surfaces to surfaces of bituminous or similar materials. Total cost, £2,844. Part II.—To convert existing gravel surfaces to granite surfaces and tar-paint. Total cost, £12,695. Grand total of scheme, £15,539. Amount expected to be received from Road Board, £9,000. Retarring of work carried out under former grants.—Second tarring of work under gift scheme, £1,513; amount expected to be received from Road Board, £756. It has also been decided to carry out tar-painting works, at an estimated cost of £6,392.

St. Austell R.D.C.—It has been agreed to supply to the county council 3,000 tons of stone from the council's quarries at 7s. per ton, and chippings at the same price. For ballast the council quoted at 5s. per cubic yard.

Norwich T.C.—It has been agreed to purchase a strip of land at the junction of Earlham-road and Mill Hill-road for the purpose of a street improvement scheme.

Somerset C.C. — At the meeting of the council recently attention was again drawn to the dangers arising from the slipperiness of the tarred roads, and it was urged that the interests of horse owners should be considered as well as those of motorists. It was suggested that the difficulty might be met by leaving an ordinary track either in the middle or at one side of the road for horses. The chairman said that no doubt the suggestions made would be considered by the county surveyor.

Stirling T.C.—It has been resolved to carry out several schemes of road repair to meet military requirements.

Weston-super-Mare U.D.C. — The surveyor, Mr. H. A. Brown, has received instructions to proceed continuously with the work of reconstructing the roads during the summer months.

SEWERAGE AND SEWAGE DISPOSAL.

Essex C.C.—The Public Health Committee submitted recently a report that they considered a proper sewerage system for Bocking of serious importance, and they were giving further consideration as to the steps to be taken.

Farnborough U.D.C.—Bacteria beds are to be installed at the sewage disposal works, at an estimated cost of £100.

Heywood T.C.—The council have under consideration a sanitary conversion scheme which is estimated to cost £5,020.

Hull T.C.—The town council have adopted the recommendation of the Health Committee that, where the owners of property failed to comply with notices served upon them to provide water-closets, and the corporation executed the work, the closets and fittings be purchased direct from the makers and supplied for fixing by contractors.

Kidderminster T.C.—The Local Government Board have intimated their approval of the scheme for sewering the new areas in the extended borough of Kidderminster, and for the new work on the sewage farm, which has been the subject of much discussion at Kidderminster, Stourport, and Bewdley. The approval is subject to certain minor amendments. The amount of money necessary to carry out the scheme is about £31,000, and the Local Government Board intimate that sanction for the loan cannot be given at present owing to the war.

Naas No. 1 R.D.C.—The tender of Messrs. Fleming Brothers at £632 has been accepted for sewerage works at Sallins.

Richmond T.C.—The council have decided on the construction, at an estimated cost of £3,925, of a total length of 843 yds. of heavy cast-iron sewer pipes of 12-in. diameter to remedy difficulties with the sewers in River-lane, Petersham, and along the towpath. The borough surveyor, Mr. J. H. Brierley, will duly issue advertisements for tenders.

Upton R.D.C.—Schemes of sewerage for Madresfield and Guarlford have been approved, but the work will not be put in hand until normal times.

WATER, GAS, AND ELECTRICITY.

Banff C.C.—The Banff District Committee have accepted the tender of Messrs. Clark & Chapman, of Aberdeen, at £1,993, for the works in connection with the additional water supply for Findochty. For the Whitemills water supply the tender of Mr. J. Watson, Banff, at £2,197, has been accepted.

Berwickshire C.C.—The Middle District Committee intimate that they have obtained sanction to the borrowing of £500 on account of the Greenlaw water scheme.

Boston T.C.—The council have received a communication from the Local Government Board on the subject of the inquiry held by their inspector at Boston in November, with reference to the quality of the local water supply. The board said they were advised that the water company's works were in several re-

spects in need of attention, and were urging upon the company that efforts should at once be made to secure these general improvements, and if it had not already been done the old reservoir should be cleaned out as soon as possible, care being taken not to endanger the supply of water.

Derry T.C.—A report on a proposed new water supply has been prepared by Mr. M. A. Robinson, M.INST.C.E., city surveyor. Mr. Robinson recommends the adoption of a scheme for bringing water from Banagher Glen. The glen lies on the south-eastern side of the road from Feeny to Dungiven, 2½ miles distant from Feeny and 3¼ miles from Dungiven, and is the junction of the Glendra, Altnaheglish, and Finglen rivers, which here unite to form the Owenrigh, a tributary of the River Roe. On the 6,000 acres proposed to be utilised at the outset there are only 174 acres of arable and grass land, and of this only 100 acres are under cultivation; the remaining 5,826 acres are all mountain upland. Professor Leebody reports most favourably regarding the quality of the water, and Mr. J. R. Kilroe, late of the Geological Survey Staff, describes the geological conditions as most satisfactory. The proposal of the city surveyor is that the present reservoirs should be utilised, the existing supply entering them being sent down the by-wash. His estimate of the cost is £209,000, which will include filtration and the provision of an aqueduct across the Foyle.

Holywood (Ireland) U.D.C.—The Local Government Board have consented to increase the loan for the water supply scheme, including the repair of the embankment of the new reservoir, to £5,700, payable to be spread over a period of [illegible].

Manchester T.C.—The Gas Committee have not yet arrived at any decision as to their future policy, except to adhere to their intention of raising the price of gas 6d. per 1,000 ft. The Electricity Committee, it is stated, intend to revise the charges, and have agreed to contribute £30,000 towards the city rates.

Morecambe T.C.—Considerable progress has been made in the electric light department, and the council this year will be able to redeem their promise to the Local Government Board to reduce the deficit to £2,000 each year.

Newton Abbot R.D.C.—While approving generally of the scheme for works of water supply at Bovey Tracey, the Local Government Board have written stating that they could not sanction the necessary loan at the present time.

Northampton T.C.—It has been decided by the Highways Committee to effect certain economies in street lighting. A number of lamps in the side streets are not to be lighted, but lamps at street entrances are to be lighted. The lighting of the 117 large high-power lamps is to be reduced by the substitution of small burners, and the painted screen on the top of these lamps is to be removed.

St. Pancras B.C.—Since the war the cost of carbons and arc-lamp globes has increased considerably, and at the municipal electricity works experiments have been made in connection with the substitution of half-watt lamps for carbon-burning lamps. For some months an experimental circuit of fourteen half-watt lamps has been in operation in Gower-street and has proved exceedingly successful. These lamps have burned for nearly 3,500 hours without a breakage, although they were only guaranteed for 800 hours. They were procured from Germany, but a source of supply is now obtainable from Holland. In view of the success of the experiment half-watt lamps are to be substituted generally for the open type of arc lamps.

MISCELLANEOUS.

Aberdeen T.C.—The council have voted Mrs. Dyack, widow of the late burgh surveyor, Mr. William Dyack, a gratuity of £400.

Conway T.C.—The borough surveyor, Mr. F. A. Delamotte, reported that the mussel purification tanks, which have been constructed at a cost of about £2,000, are now completed, and that he was awaiting the visit of the experts of the Board of Agriculture and Fisheries to carry out their experiments in bulk, to show that the process which mussels taken from the estuary will pass through before being sent to the market will effectively cleanse them.

Esher and the Dittons U.D.C.—Mr. Edgar Dudley, an inspector of the Local Government Board, has selected twenty-five of the council's workmen for recommendation by the board to the War Office in connection with the manufacture of munitions.

Flintshire C.C.—Mr. A. E. Carey, engineer, has submitted two schemes for dealing with erosion. Under the first he proposes (*a*) the construction of two groynes 180 ft. long, (*b*) planking for a distance of 100 yds., (*c*) 60 lin. ft. of universal joint steel piling 12 ft. long. The estimated cost of this scheme is £1,800. The second scheme is more comprehensive in character, and is designed to provide a permanent equilibrium of coast conditions. It consists of (*a*) eleven groynes as in (*a*) of first scheme; (*b*) to pitch the eroded front immediately to the east of the Rhyl boundary with breakers of Penmaenmawr stone bedded in Portland cement grout, for a length of 140 yds.; (*c*) at the eastern end of the protective stone-work as described in (*b*) to sheet pile in timber for a distance of 1,200 yds.; (*d*) on the inner side of the piling mentioned in (*c*) to drive similar piling; (*e*) the space between the pilings would be filled with sand, and on the top of the sand formation would be laid a reinforced concrete mattress, and above such mattress road surfacing; (*f*) to build a parapet of Penmaenmawr stone on the sea side. The estimated cost of this scheme is £15,750.

Hampton U.D.C.—The workmen, except those at the sewage works, are to receive 2s. per week extra during the war. In the case of those excepted there has been a re-arrangement of working hours.—The contract price of horse hire has been increased from 9s. to 10s. per day, in consideration of the increased cost of forage.—The names of nineteen employees have been furnished in response to the Local Government Board's circular of March 11th suggesting that local authorities should release their workmen for employment in armament work.

Maldens and Coombe U.D.C.—In response to the inquiry from the Local Government Board as to releasing men for the manufacture of munitions of war, the Finance and Establishment Committee have reported that they did not consider the matter applicable to this district. Apparently this is not the view of the Local Government Board, whose inspector has nevertheless selected twelve men for possible use.—All workmen, with the exception of unmarried men eligible for military service, in receipt of 30s. a week and under, are to be paid an additional 2s. per week during the continuance and for six months after the end of the war.

Surbiton U.D.C.—From a complete list of the names of men employed by the council, Mr. Dudley, of the Local Government Board, has selected eighteen who might be utilised in the manufacture of munitions of war.

Institution of Civil Engineers.—The annual general meeting of corporate members, to receive the report of the council, and to elect the council and auditors for the ensuing year, will be held on Tuesday next at 8 p.m. On its conclusion a special general meeting of corporate members to consider and, if approved, to adopt a proposal for the amendment of the by-laws will take place.

Motor Organisations and Private Legislation.—In accordance with their usual practice, the Royal Automobile Club and the Automobile Association and Motor Union carefully considered all Private Bills introduced into Parliament in the last Session, and it was ascertained that in a number of instances the promoters were seeking powers which, if granted, would be opposed to the interests of motorists. In several Bills power was sought to make water used for washing motor cars a non-domestic supply, which would have meant that the water companies could have refused to supply water for this purpose except on their own terms. In some cases the opposition has resulted in Bills which are being amended to meet the objections raised, while in others which are pending representations have been made to the Local Government Board as to the unsatisfactory nature of the particular proposals. Among the other Bills which have received attention are various tramway Bills in which municipal authorities have sought power to erect tramway equipments, and these proposals have been carefully investigated with a view to avoiding unnecessary obstruction on the highway by central standards, and so forth. Mention should also be made of the Blyth Corporation Bill, in which it was proposed to charge certain tolls which appeared to be of an unreasonable character. This Bill has consequently been opposed

PERSONAL.

Mr. John Alcorn, burgh surveyor and water engineer of Oban, died last week, we regret to state.

Mr. R. Blanchard, surveyor to the Cannock Urban District Council, has received an increase of salary.

Mr. A. Skinner, of the Beverley surveyor's department, has been appointed second assistant at Batley.

Mr. F. E. Wentworth-Sheilds, M.INST.C.E., at a meeting of the Concrete Institute last night, read a paper on "The Stability of Quay Walls on Earth Foundations."

Mr. Sidney F. Evershed, of the borough engineer's office, Daventry, has been appointed chief engineering assistant to Mr. John W. Harris, engineer and surveyor to the Wantage Rural District Council.

Mr. T. Lynam, surveyor to the Cudworth Urban District Council, has been congratulated by his council upon having recently passed the examination for associate-membership of the Institution of Civil Engineers.

Mr. S. Duxbury, manager of the sewage disposal works of the Maldens and Coombe Urban District Council, has been granted an increased salary of £20 per annum from April 1st, with two further annual increments of £10.

Messrs. J. C. Hennah and C. E. Sims, members of the Ham Urban District Council, have been appointed, with the surveyor, Mr. R. W. Hindhaugh, delegates to the conference shortly to be held by the National Housing and Town Planning Council.

Mr. H. A. Scott, assistant surveyor to the Maldens and Coombe Urban District Council, has, it was reported on Tuesday, been given permission to join the Army, and his position will be kept open for him, the council meanwhile paying him the difference between his salary and his Army pay.

Mr. C. J. Jenkin, engineer and surveyor to the Finchley Urban District Council, has just started for Serbia under the Serbian Relief Fund and Red Cross, to give assistance in connection with sanitary matters. He is doing so at considerable financial sacrifice, and has been given six months' leave of absence.

Mr. R. H. Jeffes, surveyor to the Maldens and Coombe Urban District Council, has been granted an increase of salary by two annual increments of £25 as from April 1st, in recognition of the extraordinary professional work carried out by him in connection with the extension of the sewage disposal works, of his acting as sanitary inspector *pro tem.*, and for undertaking additional duties in respect of the municipal allotments.

Mr. James Snook, highways superintendent and sewage farm manager to the Wimbledon Corporation—whose death we recorded in our last issue—was buried at Wimbledon cemetery on Thursday of last week, the Rev. Father Rankin delivering a short address at the graveside. At the meeting of the town council on Monday it was moved that the sincere regret of the council be conveyed to Mrs. Snook and family, and the motion was adopted in silence. The deceased left some fifty-three descendants.

Mr. C. F. Gettings, county surveyor of Worcestershire, has been elected a member of the Institution of Civil Engineers, and the following have been elected associate-members of the same body—namely, Messrs. E. A. Black, engineer's department, County Hall, Kingston-on-Thames; W. H. Eley, engineer and surveyor to the Newmarket Urban District Council; C. A. Gill, city engineer's office, Peterborough; J. R. Hadfield, surveyor's office, Berkhamsted; P. E. Harvey, borough engineer's office, Worthing; W. T. Lynam, engineer and surveyor to the Cudworth, Yorks, Urban District Council; R. C. Moon, municipal offices, Nuneaton; L. J. Small, council offices, Woodford Green; S. Walker, sewers and rivers department, city engineer's department, Birmingham; and C. Walmesley, Grizedale Lea reservoir, Barnacre, Garstang. Messrs. F. J. Manning, town hall, Luton, L. J. Rogers, council offices, Wellingborough, and J. A. Searle, municipal offices, Grimsby, have been admitted as students of the institution.

At the annual meeting of the Sheffield Society of Architects and Surveyors, held on the 15th inst., officers for the ensuing year were elected as follows: President, Mr. A. F. Watson; vice-president, Mr. C. B. Flockton; treasurer, Mr. R. W. Fowler; hon. secretary, Mr. James R. Wigfull; committee, Messrs. W. G. Buck, F. E. P. Edwards, J. R. Hall, H. I. Potter, H. L. Paterson, C. S. Sandford, C. F. Innocent, J. Lancashire, and F. H. Wrench.

The Scottish Housing Commission.—Mr. McKinnon Wood stated in the House of Commons on Tuesday, in reply to a question, that it was not yet possible to say when the Royal Commission on Housing (Scotland) would report. He understood that their inquiries covered a wide range, and that it had not yet been possible to obtain the evidence of several important witnesses, owing to circumstances connected with the war.

FOR OTHER ADVERTISEMENTS
See End of Paper.

BOROUGH OF RICHMOND (SURREY).
TO CONTRACTORS.

The Richmond (Surrey) Town Council are prepared to receive Tenders for the laying only of about 850 yards lineal of 12-in. Cast-iron Pipe Sewer, together with the construction of all necessary Manholes, along River-lane and the Towing Path, Petersham.

Drawings and Conditions of Contract may be seen, and all particulars obtained, on application to Mr. J. H. Brierley, Borough Surveyor, Town Hall, Richmond, Surrey, where a Form of Tender, together with a copy of the Specification and Bill of Quantities, may be obtained on payment of a deposit of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.

No Tender will be considered unless it is properly filled up, nor unless the Bill of Quantities and Schedule of Prices have been properly priced throughout.

Sealed Tenders, properly endorsed, must be delivered to me at the Town Hall, Richmond, Surrey, not later than noon on Wednesday, the 5th May, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

HENRY SAGAR,
Town Clerk.

Town Hall,
Richmond, Surrey.
April 19, 1915. (2,551)

BROMSGROVE URBAN DISTRICT COUNCIL.

Tenders are invited for the supply of about 500 tons of 2½-in. Machine-broken Granite, and about 400 tons of unbroken Granite (for metalling roads), delivered free at Bromsgrove Station, at such times and in such quantities as required. Tenders for both, and small samples of broken Granite, to be sent to me not later than 5th May, 1915.

The Council does not bind itself to accept the lowest or any Tender.

FRANCIS J. RUSSON,
Clerk.

New-road, Bromsgrove. (2,548)

DISTRICT ENGINEER required for the Public Works Department, British Guiana. Three years' agreement, with possible extension. Age, 23—40. Salary, £300—£20—£400. Free first-class passages out and home. Candidates should have a practical and theoretical training in Civil Engineering, and Membership in the Institute of Civil Engineers is desirable, but not compulsory. Those candidates having had considerable Municipal experience under a first-class English Corporation will be most favourably considered in connection with the foregoing requirements. Apply at once, by letter, to the Crown Agents for the Colonies, Whitehall-gardens, London, S.W. (2,549)

ROADSTONE GRANITE QUARRY.—The Proprietors of a well-equipped Quarry, capable of a large output, desire to meet with a Quarry Manager who would undertake the production of Road Metal at an agreed price per ton free on board steamer alongside Quarry. The Quarry is well developed, possesses great advantages, and to anyone thoroughly acquainted with Quarrying, Crushing Machinery, Loading, &c., offers an exceptional opportunity. Reply, with full particulars of previous experience, Box 1,520, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,550)

Modern Methods of Road Construction and Maintenance.

DISCUSSION AT THE SOCIETY OF ENGINEERS.

The paper entitled "Main Roads: Past and Present, and Modern Methods of Construction and Maintenance," which Mr. Frank Grove, engineer and county surveyor of Surrey, read at the last meeting of the Society of Engineers, produced a most interesting discussion, of which we append a report herewith. The contribution, we may mention, was reproduced in our issue of last week. Mr. Norman Scorgie, M.INST.C.E., the president, occupied the chair during the proceedings.

Mr. H. Percy Boulnois (Westminster) opened the discussion. It had, he said, given him great pleasure to hear Mr. Grove's paper, and he desired to tender to the author his congratulations for the research he had undertaken in the preparation of the contribution and the practical knowledge of the subject that he had displayed. Taking the various points in the paper as they might be brought, in speaking of the French roads in the eighteenth century Mr. Grove had alluded to [illegible] the most important [illegible] highways [illegible] date—viz., the Routes Imperiales—after which came the Routes Nationale and the Routes Départementale. That was important, for any French engineer who knew the roads before 1870 would recognise the Imperial roads were left out. Before the Franco-Prussian War he was engaged as an [illegible] engineer on a railway in France, and had a considerable knowledge of the French roads of that date. The author had stated that the majority of the old Surrey roads were lacking in good foundations, and no doubt [illegible] suffered to some [illegible] for the laxity of the past. Telford might have intended to put proper foundations to the roads, but many of the highways constructed by him when broken open were found to be lacking in that respect. Fortunately, however, in the passage of time the metal had become sufficiently consolidated in many cases to render unnecessary the construction of fresh foundations. He was glad to see that a tribute was paid to flint roads—he was speaking entirely of water-bound macadam to begin with. He had constructed miles of roads for light traffic in the old days, and for that class of road there was nothing better than flint. He agreed, of course, that it was not as strong as a granite road; but, as had been pointed out, the constant flooding of a granite road did it a great deal of harm, whereas a flint road did not seem to suffer to the same degree. He thought a flint road drained better than a hard water-bound macadam road. After all, water was, as they knew, as great an enemy to roads as traffic. In regard to the damage done to roads by the sucking action of the rubber tyres of motor cars, his own opinion was that the principal damage was caused, not by sucking action, but by the brushing action. He would give them an instance of that which he thought confirmed his theory. At Waterloo Station there was a new method in which taxi-cabs assembled for the purpose of picking up passengers. These vehicles never moved except at a crawl, but the near-side channel of the road had worn into a deep groove, while the main body of the road had scarcely worn at all. He thought this was a proof that the brushing action of the wheels was disastrous to the pavement, which was wood. The same brushing action took place when the motors changed speed, as the wheels rotated quickly without the vehicle progressing to the same extent. Mr. Grove had spoken rather favourably of hand tarring, but later on had drawn attention to the various machines now on the market to which spreaders and brushes were attached. What was his view with regard to the advantages, if there were any, of using a machine as against hand tarring? His (the speaker's) opinion was that the machine had many advantages: first, it enabled them to do the work more expeditiously; secondly, it made it possible to regulate the amount of tar applied; and thirdly, by using a pressure machine one got two effects—a blast of hot air which blew away the last particles of dust, and then the tar was finely atomised and driven into the road. Those were points in favour of the machine. The gritting of the road after the application of the tar had been mentioned by Mr. Grove, but he had the impression that in Surrey they did not approve of putting grit and chippings on the surface of the road. Tarred slag had also been spoken of favourably in the paper, and he (Mr. Boulnois) confessed he was a convert to that material. When it was first introduced he could not believe that an artificial material like that could be so hard and so useful for road making as granite, but from what he had seen in various parts of the country, it seemed to him that tarred slag improved up to a point with wear, and did not move in the same way as tarred granite. As to rolling, there, again, there was room for improvement. Rolling had now reached a stage when it wanted more scientific treatment. What was required was a machine that would give a light weight to start with and a heavier weight for final consolidation. It was claimed that the three-axle roller effected this, in addition to avoiding the waviness with which they were occasionally troubled. The author did not seem very favourably impressed with pitch-grouted macadam. There had, of course, been great failures with that material, but there had also been some great successes—at Hornsey, for instance, where Mr. Lovegrove had mastered the subject very thoroughly. He was at one time a great advocate of hardwood paving, but the material had failed to some extent, he thought, because it was too hard. The arrises chipped off and they got an uneven road, and his view was that the only really scientific method of employing hardwood was to be found in sectional blocks. In regard to the question of bituminous surfaces, many of them believed that the carpeting system would be adopted in the road of the future. Engineers appeared to be trying to make an artificial natural road asphalt—trying to improve on Nature! He congratulated Mr. Grove on the diagrams and the explanations he had given of the plant described in his paper. As to the submerged reinforced-concrete kerbs, he agreed with the author that the haunches of the road should be thoroughly strong. He had seen many failures owing to the spreading that took place, but if the haunches were made strong enough that would not occur. He congratulated Mr. Grove on the figure at which he produced his carpet and base coat; it was exceedingly reasonable if it were done at 4s. 6d. per square yard. Concluding his remarks Mr. Boulnois said he honestly believed that the improvements in the roads had been considerably helped by the assistance of the Road Board. If it had not been for the money which they had contributed many of the counties—with the exception of the richer ones—could not have done what they had done. He had seen roads all over Europe, and he maintained that the roads of this country were the best in the world. He had an opportunity some two years ago of seeing some of the Spanish roads. Those were too terrible for words, and he had heard that a week or two before he went out a mule was drowned in one of the ruts.

Mr. H. T. Chapman, county surveyor of Kent, observed that Mr. Grove's paper was most interesting, and he was sure they were all deeply indebted to him for it. He thought the duties of road engineers were never more difficult than they were at the present moment. The task that they had before them was to make roads with an insufficient supply of proper materials or other facilities. It was at present almost impossible to get imported materials, and it would be more than ever necessary to utilise local materials to their fullest extent, and this, he thought, they could do only by treatment in some bituminous method, as was being done in Surrey and Kent. He was, perhaps, more interested in the particulars as regards bituminous carpeting than any other portion of the paper. Single-coat work was no use where there was heavy traffic. He had experienced that already, and unless some base coat was provided for the carpet to be laid on, they were going to have trouble. He was utilising local materials, such as flint and crushed shingle, treated with pitch and surfaced with bitumen. He did not quite agree that the waviness which occurred in road surfaces was in all cases due to the

effects of the rolling. His view was that this came with the motor-bus and heavy fast-moving traffic of the present day, and would be encountered however good the surface was to start with. No doubt it would be gradually reduced by scientific methods of rolling, and he agreed that the practice of rolling from the sides to the centre to commence with was better than longitudinal rolling. Granite-sett paving was a matter that had not been mentioned to any extent, of course, on rural roads carrying light traffic they could not afford that at the present time, but in the case of many of the roads he had experience of in Lancashire and in the neighbourhood of the large county boroughs this had proved the most economical paving. In regard to the use of Portland cement as a filler, he thought Mr. Grove would agree with him that there was no cementitious value required, and that it was simply used to make a particularly dense mixture. He had used pulverised clay, ground as fine as Portland cement, with equally good results. Also in pitch-grouted work he had used, instead of sand, the same filler, with a low specific gravity, and had found that the result was that a very much larger area could be treated with the same weight of material, and that there had not been softening owing to high temperatures in the summer.

Mr. F. Wilkinson, deputy borough engineer of Wimbledon, stated that in his district flint roads after having been tarred stood better during the winter months than any of the tarred macadam roads. He thought that was due to the thicker coat of tar that could be put on the flint roads. Last summer they laid down asphalt on one of their roads and watched motor cars and 'buses going over it, and he agreed with Mr. Boulnois that it was the brushing action which began the corrugations in the road where the stopping and starting of vehicles went on, and that they were deepest at those points. As to machine versus hand spreading, so far as his observations had gone, the machine-spreading beat the hand-spreading any time, although his chief, Mr. Coopér, was a firm believer in hand-spread tar. If engineers paid more attention to tar-macadam, he thought it would come out much better than any of the asphalt or bituminous roads that had been laid. His belief was that the tar-macadam slag road was the road of the future. As a means of overcoming the trouble of corrugation, Mr. Cooper had tried the experiment of putting down a large steel plate in front of the roller, as the roller in changing direction rested twice as long at that point as at any other, and so would tend to cause corrugation if the plate were not used. He agreed that the figure of 4s. 6d. for the carpet and base coat was very low indeed. He did not know anything about three-axle rollers, except that the roads over which they were used seemed to be quite as wavy as those consolidated with two-axle rollers. The paper did not say anything about reinforced concrete foundations. A good foundation was everything in a road. He would like to know whether the author had had any experience of reinforced concrete roads; if so, what conclusions had he come to with regard to them?

Mr. W. H. Grieves, engineer and surveyor to the Sutton, Surrey, Urban District Council, said he quite agreed that flint roads were excellent for light traffic roads, especially when they could be tarred every summer; in fact, he did not know of a road in which they secured better penetration of the tar. He had found some recently where the penetration after two years appeared to be at least 2 in. The work was done with a tar-spraying machine, and he favoured a machine as against hand-tarring, although the latter was cheaper. The difference in cost, however, only ranged between 1d., 1½d., and 1¾d., including everything. He agreed with Mr. Grove that wood paving was an excellent paving to lay, but he did not quite agree with him in regard to the thickness of the concrete foundation; in these days, owing to the severity of the motor traffic, a foundation of not less than 8 in. to 9 in. was required. As to the corrugations, these were found in the old-fashioned macadam roads, and were not only formed by the traffic, but by the action of water probably more than anything else. When a severe rainstorm occurred, little rivulets flowed from the centre to the side of the road, and this was where many of the corrugations appeared. It was a very intricate problem to solve, especially on macadam roads; but he had no hesitation in saying that even the waves on bituminous roads would be eventually overcome.

Mr. W. Menzies, highways surveyor to the Egham Urban District Council, observed that road surveyors knew perfectly well that the damage as a result of the opening of roads by gas, water, electric and other companies was one of the most trying things they had to put up with, and he thought some authority, such as the Road Board, should take steps to obtain power by which the various companies could be compelled to restore the roads to the *status quo*. Mr. Groves, in referring to one-coat tar-macadam work, advocated that "after being subjected to traffic for a month or two the surface should be dressed with tar and chippings so as to fill up all voids." He would like to know why there should be that interval in the operations. He generally found it was better to do the work as soon as possible after the tar-macadam had been laid rather than give the traffic a chance of wearing off the surface of the newly laid material. Mr. Groves had also asserted that wood-block paving "is perhaps the best form of construction for roads with a great amount of traffic, particularly upon motor-omnibus routes." No mention was made, however, of granite-pitched cubes, which, in his view, would be the road of the future.

Mr. Percy Griffith (Westminster) remarked that the last speaker had not been very complimentary to the companies responsible for the gas, water and electric light services. Those authorities, however, did not, as a rule, open the roads for fun. The work was costly, and was not undertaken without serious necessity. The filling of trenches and maintenance of the disturbed surface was costly work, and if subways could be provided for the reception of the pipes and cables the companies would use them with pleasure. As a matter of fact, it was becoming a general practice to leave the repair of the roads in the hands of the surveyor, and pay for the work; in that case he could not grumble at the state of the roads afterwards, although probably the users of the roads did not find the result much better than when the gas and water companies did the work themselves. The subject was a difficult one, but it must not be forgotten that the pipes laid under the roads were a necessity to the community as the roads themselves.

Mr. T. E. Ware, highways surveyor to the Epsom Rural District Council, stated that for fourteen years he had followed the practice of tarring roads by hand, but this year, owing to the scarcity of labour, he had been compelled to adopt machine work. He did not agree with Mr. Boulnois that tar projected on to the road was any use at all; they got absolutely the best results where the tar was allowed to sink into the road. He should like to know exactly how to stop corrugations. He agreed with Mr. Chapman that corrugations were not all due to the roller, although in some cases [illegible] by it.

Mr. E. H. Collcutt (Surrey) said that the gentleman who had so ably championed the cause of the gas and water companies had mentioned that in many cases the work was left in the hands of the road authorities. Did he refer to the reinstatement of the surface alone or to the actual filling of the trench? The difficulty seemed to be with regard to the latter, and the repair of the surface was a comparatively simple matter if the subsidence due to bad consolidation lower down could be avoided.

Mr. Griffith was understood to reply that he referred to the repair of the surface only.

The President (Mr. Norman Scorgie), in closing the discussion, also referred to the reinstatement of roads, but said he could not agree that the difficulty arose from the badly filled-in trench. He was sure everyone would realise, and no one more so than those having charge of roads, that, however well a trench was filled in, the road could never be brought back to precisely the same condition it was in before an opening was made. One realised that gas and water, particularly the latter, were a necessity of life, but what engineers complained about more than anything else was that the companies would not take the opportunity of doing their work before a road was made up. Frequently they were advised that a certain road was to be dealt with, but took no notice until the work was finished. He was certain everyone was interested in Mr. Boulnois' remarks in opening the discussion, and he would like to support his observations with regard to the condition of British roads; there were no highways in any other country comparable with those of this

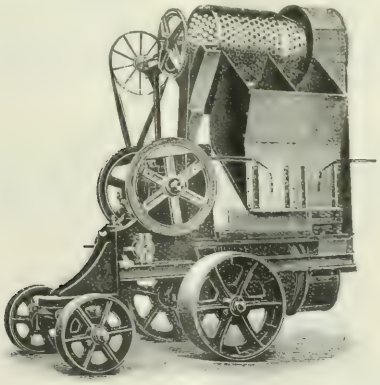
country. He had travelled over some thousands of miles of Continental roads but had nowhere found roads equal to their own. In Austria they had a method of darning the roads, but the difficulty here was that one could not get a man to "marry" his new work into the old. He would like to give a word of warning to those engineers who might be inclined to adopt the use of excavated road material mixed with new for the bottom coat of a bituminous road, for, however carefully one might screen the old material, there was undoubtedly a slight film of uncementitious material adhering to the old stone, and it was questionable whether with that they would get the bottom to adhere to the granite so as to get a solid mass after rolling.

Mr. GROVE, in replying, said he would be pleased to add a reference in his paper to the French Routes Imperiales, spoken of by Mr. Boulnois. He was entirely in agreement with him as regards their roads, but with regard to the wear of the wood paving in Waterloo Station, mentioned by Mr. Boulnois, he might suggest that this was probably due to the sudden manner in which the drivers put on their brakes, causing the wheels to skid. Opinions differed as to the merits of hand and machine tarring, but the results achieved by hand in Mr. Ware's district for many years had been superior to those obtained by machine; he seemed to be able to get the tar well into the stone by the hand method. Like Mr. Chapman, they were suffering in Surrey from the inability to obtain material for roads. He agreed that single-coat work, except under favourable circumstances, was not satisfactory as compared with double-coat work. They had little sett paving in Surrey. In regard to gas, water and other trenches, he must say that he was of opinion that if the local authorities [illegible] was laid and saw to the filling and ramming right from the start they would make a much better job of it than the companies. It was not much good trying to prevent the subsidence of the surface if the ramming was not properly done in the first place. In regard to the point as to leaving the road for a month before tarring the surface, when the roller left the road the material was not thoroughly consolidated, and it was necessary for the traffic to do that.

DUBLIN SPRING SHOW EXHIBITS.

"ACME" STONEBREAKERS.

Among the exhibits at the Dublin Spring Show last week was one of the Leicester firm of Messrs. Goodwin, Barsby & Co.'s portable automatic stonebreakers, with lower and upper screens, elevators, loading hoppers, &c., a design which is much favoured by county and town councils. Out of the eighteen



Irish county councils using the patent "Acme" stonebreaker, this is the machine usually preferred.

Wexford County Council (Mr. W. F. Barry, ASSOC.M.INST.C.E., county surveyor) have just placed an order with the firm for a third machine of this class, and the company have on order a similar machine for the Kilkenny County Council (Mr. A. M. Burden, ASSOC.M.INST.C.E., county surveyor).

INSTITUTION OF MECHANICAL ENGINEERS.

PRESIDENTIAL ADDRESS.

Dr. W. Cawthorne Unwin, F.R.S., on Friday evening last delivered his inaugural address as president of the Institution of Mechanical Engineers.

Nothing was more significant in the last half-century, said Dr. Unwin, than the growing importance of engineering. The engineer was more and more looked up to for the solution of industrial, civic and national problems. The war had not left us as we were before. In standing shoulder to shoulder in a common cause, in consenting to some abbreviation of liberty, we were losing a little of our extreme belief in individualism and our suspicion of State action, and that was likely to increase the sphere of work and the demand for the expert knowledge of the engineer.

After touching on the work of the institution, and the part it had taken, in association with the Institutions of Civil and Electrical Engineers, in recruiting an engineer unit for the new Royal Naval Division, and making a short allusion to the subject of meetings which, to meet the wishes of country members, are now being held in local centres, the president went on to speak of the institution's examinations.

EXAMINATIONS.

Membership was accepted as, to some extent, a certificate of competence, and its value was due to the fact that entrance to its ranks was guarded. A candidate must be proposed, must state his qualifications, and must run the gauntlet of strict scrutiny by the council, and finally by the members at large. Mistakes might be made, for it was human to err at times, but great care was taken.

"The appraisement of the qualifications of candidates," Dr. Unwin proceeded, "is not easy, and is specially difficult in the case of younger candidates who have no long record of work. Hence the institution, following the example of the civil engineers, the architects, the surveyors, and others, has instituted an examination for candidates under thirty years of age. No doubt an examination test is not infallible, but it more often lets through the doubtful than it excludes the qualified. Dr. Welldon, when pointing out some evils of crude methods of public competitive examination, said that the attaining [illegible] standard rather than supremacy over competitors was the best means of selection. Now, our examination is of that type. Also the diplomas of various universities and technical schools, granted on conditions which are trustworthy, are accepted in lieu of our own examination.

"The examination does secure that young engineers are stimulated to study seriously principles involved in engineering practice and mathematical tools useful to the engineer. Though the examination looks like an obstacle, I do not think that in after life any one who passed it will complain that he was driven to study at a time when the mind was receptive and tenacious, 'wax to receive and marble to retain.'"

RESEARCH.

The president observed that the institution had distinguished itself very honourably by fostering research in subjects important to engineers. Some of them who moved in professorial circles get perhaps a little tired of the insistence on the importance of research for students. Research for the solution of new problems was of great importance, but it was not a task for young and immature students. Many so-called researches, in which well-understood methods were applied to materials or subjects not themselves important, hardly deserved the name. They amounted to little more than class exercises. Most scientific societies received papers in which a much over-elaborated description was given of known proceedings and precautions, in which the new results were of limited value without establishing any general law. But the value of real research, based on a clear formulation of a definite unsolved problem, could not be over-estimated.

Unfortunately, in engineering, the solution of unsolved but important problems was generally both difficult and expensive. Much, no doubt, was done by manufacturers who had a financial interest in the work. But their researches were, in general, not fully published. It was of great interest to the public at large and to other engineers that a scientific institution like theirs felt it part of its duty to advance knowledge by research, and was able to devote a

fraction of its income for such researches as were beyond the means of private engineers. In most cases a Research Committee of the institution began by an investigation of what had been done before, and the summary of previous investigations which the institution published was not only a safeguard against mere repetition of experiment, but was valuable in itself. Prof. Martens, the director of the great State laboratory at Grosslichterfelde, had said that in four cases out of five when a manufacturer brought him a problem it was found that it had already been solved somewhere by somebody.

TESTING MATERIALS.

In some remarks on this subject Dr. Unwin pointed out that, whereas half a century ago most materials of construction were selected and bought on the reputation of the manufacturer, hardly any material in large use now was accepted without special testing in the interest of the purchaser.

"On the Continent and in the United States there are," he said, "public laboratories, supported by the State, where anyone can have tests made, at moderate fixed rates, by a trained scientific staff, and with great accuracy. Such institutions assist industry if on the one hand they meet industrial requirements, and on the other are unbiassed by private interests. They have the advantage over private laboratories that they are under the direction of experts of exceptional experience and reputation, and are able to pursue investigation, continued often for long periods, beyond immediate requirements into fruitful by-paths. The view taken in Germany is that the work accomplished is partly of advantage to the manufacturer who calls for assistance, and so far should be paid for by him, and partly is of advantage to the nation in advancing science, which is the justification for a State subsidy. Hence it is incumbent on the public institution to publish results as freely as is possible without injuring private interests.

"At Grosslichterfelde the annual income from fees for testing amounts to £20,000, and the annual State subsidy is £12,000. On the staff there are 230 persons, of whom 75 have had university training and 38 technical high school training. Since 1880 the work accomplished has steadily and regularly increased.

"The Bureau of Standards at Washington is on a still larger scale, and does very similar work. It receives an annual subsidy from the Federal Government of £100,000. The equipment is extraordinarily complete. For instance, it has a 600-ton testing machine at Washington, and a 1,000-ton testing machine at Pittsburg, both of the highest sensitiveness and accuracy. Such machines do not exist in this country. Happily, we have now a similar institution in the National Physical Laboratory at Teddington. Its functions are somewhat restricted by the characteristic English jealousy of State action, which, I think, is diminishing. It would be difficult to overestimate the service it has done in the solution of various mechanical, electrical and physical problems which were unlikely to be attacked by private persons."

Concluding, the president remarked that ordinary tests were of a somewhat arbitrary character, and did not completely imitate the conditions of actual service. We tested specimens of steel to destruction, and measured ductility by plastic deformation, though in use the stresses did not exceed the elastic limit and the deformation was elastic. We tested cement in tension, and used it in compression. There was need for constant criticism of methods of testing and for the invention of new tests—such as tests for hardness and brittleness—although new tests must be cautiously introduced.

One small change could be easily made, and in some cases would be interesting. When a set of tests on a material had been made, the mean of the results was taken as the best value of the property measured. In physical investigations generally a further step was taken by calculating what was termed the "probable error," which, broadly, was a measure of the trustworthiness of the results. Calculation of the probable error was troublesome, but Martens had pointed out that the "mean error" was nearly as accurate, and good enough for practical purposes. The mean error was the sum of the deviations of the individual results from the mean, irrespective of sign, divided by the number of observations. The mean error was conveniently expressed as a percentage of the mean value. If the mean error was large, either the method of testing, the uniformity of the material, or the preparation of the test specimens was at fault. Generally the source of the error could be inferred. A large mean error in tests of steel would indicate want of uniform quality in the material, in cement—probably faults in preparing the test biquettes. Of two supplies of a material, that with the smallest mean error was preferable.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

METROPOLITAN DISTRICT MEETING.

At a Metropolitan District meeting to be held at 92 Victoria-street, Westminster, on April 30th, at 7.30 p.m., a discussion will take place on "The Heavy Traffic Problems of London."

Members in Greater London are specially invited.

SCARBOROUGH MEETING.

An institution meeting will be held in the North-Eastern District at Scarborough on Saturday, May 8th.

PROGRAMME.

10 a.m.—Assemble at the town hall.

10.15 a.m.—Reception by his Worship the Mayor (Mr. C. C. Graham). A paper entitled "Catering for the Wants of the Holiday-maker," by Mr. Harry W. Smith, Assoc.M.Inst.C.E., borough engineer and surveyor, will be taken as read. Any discussion thereon may take place at the close of the meeting after the various works have been inspected.

10.45 a.m.—Inspection of Spa improvements, beach bungalows, South Cliff Gardens, bathing pool, &c., in the South Bay.

1 p.m.—Lunch at the Grand Hotel. (Tickets, 3s. each.)

2 p.m.—Meeting of the members of the North-Eastern District to consider—

(*a*) The report of the Executive Committee as to the desirability of reporting the proceedings of district meetings in the Press.

(*b*) Any other business.

2.30 p.m.—Leave the Grand Hotel by char-à-banc (tickets 2s. each) for the Castle Hill, to view the damage caused by the bombardment on December 16, 1914, by the German battleships, and to inspect the Keep.

3.15 p.m.—Leave the Castle Hill, and inspect the Alexandra Gardens, Floral Hall, Peasholm Park, and the beach bungalows and bathing establishment in the North Bay.

4.30 p.m.—Leave the north end of the Royal Albert-drive by motor char-à-banc for drive along the Marine-drive, Valley Park, to the Mere.

5.15 p.m.—Afternoon tea at the town hall by the kind invitation of his Worship the Mayor (Mr. C. C. Graham).

AYR MEETING.

At the Scottish District annual meeting to be held at Ayr on June 4th and 5th, papers on town planning, municipal housing, road work, and scraping of water mains will be submitted.

On the first day visits will be paid to the municipal works of the town, and the following day will be devoted to inspections of experimental road stretches in Ayr County and Hillhouse Quarry, and to a visit to Loch Doon.

MATLOCK MEETING.

The arrangements for the institution meeting to be held at Matlock on June 12th include visits to the new sewage works, the brine and electric baths, and other undertakings.

J. W. Dudley Robinson,
Secretary.

92 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

SOUTHERN AND SOUTH-EASTERN DISTRICTS.

A visit will be paid to-morrow (Saturday) to the New County Hall Works of the London County Council.

Members will meet on the site of the works, Belvedere-road, Westminster Bridge, at 2.30.

The contract now in progress embraces roughly some three-fourths of the complete building (the northern blocks being not yet commenced), and the bulk of the work is at about second floor level.

Arthur Palmer,
Hon. District Secretary.

Town Hall,
Greenwich

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

INSPECTOR OF NUISANCES.—April 26th.—Ross-ford Rural District Council. £130—£150 per annum. —Mr. T. W. V. Greenwood, clerk.

INSPECTOR OF NUISANCES.—April 27th.—Hindley Urban District Council. £100 per annum. Mr. T. Roberts, clerk.

TEMPORARY SURVEYOR AND INSPECTOR OF NUISANCES.—April 29th.—Halstead Urban District Council. £3 per week. Mr. Robert Mann, Council Office, 24 High-street, Halstead.

ROAD FOREMAN.—April 29th.—Tilbury Urban District Council. 35s. per week, and 3s. per week war bonus.—Mr. S. A. Hill-Willis, engineer and surveyor, Council Offices, Tilbury.

ASSISTANT ROAD FOREMAN.—April 30th.—Corporation of Ealing. 42s. per week.—Mr. W. R. Hicks, borough engineer and surveyor.

ASSISTANT ENGINEER. — May 1st. — Colombo Municipal Council. Rs.4,500/- per annum, with a commuted allowance of Rs. 900/- per annum. Mr. R. Eustace Tickell, Institution of Civil Engineers, Great George-street, Westminster, London, S.W.

ROAD FOREMAN.—May 1st.—Dentdale Town Council. Mr. E. Parry, town clerk.

INSPECTOR OF NUISANCES.—May 3rd.—Corporation of Bradford. £90 per annum. Mr. F. Stevens, town clerk.

BOROUGH SURVEYOR.—May 3rd.—Corporation of Newark. £250 a year.—Mr. Godfrey Tallents, town clerk.

BOROUGH SURVEYOR. — May 15th. — Newport (I.W.) Town Council. £225—£250 per annum.—Mr. T. Ross Pratt, town clerk.

CLERK OF WORKS.—Tyldesley Urban District Council. £2 10s. per week.—Mr. Francis E. Jones, engineer and surveyor, Council Offices, Tyldesley.

ASSISTANT ENGINEERS.—Public Works Department, Government of the Gold Coast. £350—£400 a year, with furnished quarters.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

GALEMIRE.—Designs for a small hospital, for the Galemire (Whitehaven) Joint Hospital Committee.—Mr. E. B. Croasdell, clerk, Union Hall, Whitehaven.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

CAMPBELTOWN.—April 24th.—For repairs and renewals to woodwork at old quay, for the corporation. —Mr. J. Fullerton, master of works.

RATHDRUM.—April 26th.—For the erection of fifty-nine labourers' cottages, and ten cottages in pairs, for the rural district council.—The Clerk.

BUCKLOW.—April 27th.—For the construction of a concrete tube culvert, for the rural district council. —Mr. R. C. Cordon, highway surveyor, Cranford-avenue, Knutsford.

UXBRIDGE.—April 27th.—For the erection of a corrugated-iron bathing shed, for the urban district council.—Mr. W. L. Eves, surveyor, 54 High-street, Uxbridge.

DUNDALK.—April 27th.—For alterations to buildings, and the erection of boundary walls, for the urban district council.—The Surveyor.

GLASGOW.—April 28th.—For the erection of two tenements, for the corporation.—Office of Public Works, 64 Cochrane-street.

NEWYLN.—April 28th.—For the construction of a reinforced-concrete face wall, for the Pier and Harbour Commissioners.—Messrs. Douglass, Lewis & Douglass, 15 Victoria-street, Westminster, S.W.

GLASGOW.—April 29th.—For the wright and joiner's work in connection with the erection of a sanatorium and children's home, for the corporation. —Office of Works, 64 Cochrane-street, Glasgow.

LINTHWAITE.—April 30th.—For the erection of twenty-four houses, for the urban district council.—Mr. J. Ainley, architect, Chapel-street, Slaithwaite, Yorks.

DARTON.—May 10th.—For the erection of boundary walls and other works, for the urban district council. —Mr. S. Wilkinson, surveyor.

Iron and Steel.

RICHMOND (Surrey).—May 5th.—For the supply of 100 tons of heavy cast-iron pipes and special castings, for the corporation.—Mr. J. H. Brierley, borough surveyor, Town Hall.

ST. PANCRAS.—May 11th.—For steel constructional work, for the borough council.—Mr. C. H. F. Barrett, town clerk.

GOSPORT AND ALVERSTOKE.—May 13th.—For the supply of a pair of 18-in. stroke horizontal cross high-pressure, double-acting air compressors, with all necessary valves, pipe connections and foundations, for the urban district council.—Mr. H. Frost, engineer and surveyor, Gosport.

Roads.

AIRDRIE.—April 26th.—For the supply of road metal, kerb and channel work, granolithic paving and carting, for the corporation.—Mr. J. K. Frazer, burgh surveyor.

BURGESS HILL.—April 26th.—For the supply of granite and 10,000 gallons of refined coal tar, for the urban district council.—The Surveyor.

WARMLEY.—April 26th.—For making up a road, for the rural district council.—Mr. H. W. Bennett, surveyor.

WIGAN.—April 26th.—For the supply of granite setts, for the corporation—Mr. A. T. Gooseman, borough engineer.

EASTBOURNE.—April 26th.—For the execution of private street works, for the corporation.—Mr. A. E. Prescott, borough surveyor.

HETTON-LE-HOLE.—April 26th.—For the supply of tarred slag and slag, for the urban district council. —Mr. J. Harding, surveyor.

SOUTHWICK.—April 26th.—For the supply of flints and flint gravel, for the urban district council. —Mr. J. S. Mant, deputy surveyor.

ST. NEOTS.—April 27th.—For the supply of broken granite, basalt, tar-macadam, and slag dust, for the urban district council.—Mr. J. Edey, surveyor.

WHITSTABLE.—April 27th.—For the supply of flints, hoggin, brick rubbish, sand, ballast, crushed flints, tar, cement, tar-macadam, and steam rolling, for the urban district council.—Mr. F. Laurens, surveyor.

BLACKPOOL.—April 29th.—For the supply of 2,200 tons of 2-in. tarred granite stone, and 500 tons of ¾-in. tarred granite chippings, for the corporation.—Mr. John S. Brodie, borough surveyor.

SAFFRON WALDEN.—May 1st.—For the supply of granite macadam and granite chips, for the corporation.—Mr. A. H. Forbes, borough surveyor.

ROMFORD.—May 3rd.—For the supply of broken granite and granite chippings, for the urban district council.—The Surveyor.

SWANAGE.—May 3rd.—For providing material and labour for tar-spraying, for the urban district council.—Mr. W. H. Pearce, surveyor.

ELHAM.—May 4th.—For the supply of granite and basalt, for the rural district council.—The Highway Surveyor, Lyminge, Kent.

FULHAM.—May 5th.—For making up a new street, for the borough council.—Mr. F. Wood, borough surveyor.

LEXDEN AND WINSTREE.—May 8th.—For the hire of one or two steam road rollers, for the rural district council.—Mr. Jean Emans, surveyor, Lexden, Colchester.

MOUNTAIN ASH.—May 11th.—For the execution of street improvements, for the urban district council.—Mr. W. G. Thomas, surveyor.

EAST GRINSTEAD.—May 12th.—For making up a road, for the rural district council.—Mr. C. Turton, surveyor, 6 High-street, East Grinstead.

EAST STOW.—May 19th.—For surface-water draining, kerbing, channelling, and road making, for the rural district council.—Mr. Henry E. Wilkes, clerk, Market-place, Stowmarket.

Sanitary.

NEW ROSS.—April 26th.—For the construction of sewerage works, for the urban district council.—The Clerk.

ROTHERHAM.—April 26th.—For laying stoneware pipe sewer, for the rural district council.—Mr. B. Hey, engineer.

KEIGHLEY.—April 26th.—For the construction of a pipe sewer, for the corporation.—The Borough Engineer.

CAERPHILLY.—April 27th.—For the construction of sewers, drains and house connections, for the urban district council.—Mr. A. O. Harpur, surveyor.

RHONDDA.—April 27th.—For laying stoneware sewer pipes, for the urban district council.—Mr. E. H. Barber, engineer and surveyor.

COLCHESTER.—April 27th.—For the underdraining of a cemetery site.—Mr. G. T. Forrest, county architect, 79 Duke-street, Chelmsford.

HOLLINGBOURNE.—April 28th.—For the construction of a sewer and manholes, for the rural district council.—Mr. H. M. Apps, sanitary inspector, Sutton Valence, near Maidstone.

LLANTRISANT.—April 29th.—For sewer extension and surface-water drainage, for the rural district council.—Mr. T. Saunders, surveyor.

BRANDON AND BYSHOTTLES.—April 30th.—For works of sewerage, for the urban district council.—Mr. A. A. Luxmoore, 5 North Bailey, Durham.

RAWMARSH.—For relaying part of the main sewers in the South Ward, comprising about 700 yds. of 18-in. pipes or tubes, and 700 yds. of 9-in. pipes, with manholes, flushing chambers, and ventilation shafts, for the urban district council.—Mr. J. A. Tonge, engineer, Parkgate, Yorks.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyors with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

BENTLEY.—For the supply of tar-macadam, whinstone and dross, for the urban district council.—Mr. R. G. Whitley, surveyor:—

Whinstone.—Shap Granite Company, Westmorland.
Slag.—Aizlewood & Sons, Rotherham.
Tarred Macadam.—Contract and Works Supply Company, Scunthorpe.

BISHOP'S STORTFORD.—The following tenders have been accepted by the urban district council:—

Brooms, Picks, Shovels and Sundries, Cylinder and Gas-engine Oil and Disinfectants.—H. Sparrow.
Rotary Brushes, Buckets, Spikes and Sponge Cloths.—Mosers, Limited.
Road Picks, Mud Scoops, Grafting Tools and Contractors' Forks.—Yates & Co.
Machinery Oil.—Vacuum Oil Company.
Iron Castings, Stoneware Pipes and Gullies, and Portland Cement.—W. Hughes.
Wrought-iron Tubing.—J. Russell & Sons.

INCE.—For the construction of sewage disposal works, for the urban district council.—Mr. A. T. Swain, engineer and surveyor:

J. Bentley, Bradford	£13,550
W. J. Beckett-ish, Wigan	[illegible]
H. E. Buckley, Bradford	13,000
Smith Brothers, Burnley	12,734
F. E. Bates, Goole	[illegible]
W. Jowett, Preseot	11,[illegible]
Bentley & Jubb, Wigan	[illegible]
Clegg Brothers, Burnley	[illegible]
Cowburn & Sons, Hindley	10,555
J. & H. Houghton, Wigan	10,461
Webster & Winstanley, Wigan	[illegible]
J. Horrocks, Westhoughton	10,164

LYNN.—Tenders for the supply of road materials for the year ending March 31, 1916, have been accepted as follows:—

Sommerfeld & Thomas, Limited.—Whinstone granite at 12s. 6d. and 13s. 6d. per ton.
Lancaster & Bateman.—Pebbles, granite at 7s. and 7s. per ton, and for Mountsorrel kerb and channels.
Ellis & Everard.—Bardon Hill granite and chippings from 13s. 2d. to 9s. 4d. per ton.
J. Collett & Son.—Tarred slag at 15s. 3d. and 15s. 6d., subject to sample being satisfactory.
E. P. Davis.—Tarred slag at [illegible] and [illegible], subject to sample being satisfactory.
Dawber, Townsley & Co.—Blue Staffordshire bricks at 85s. 6d.; wire-cut brindles at 106s.; stock bricks at 27s. per 1,000.

SALTASH.—Accepted for the supply of broken granite, granite chippings and Penryn [illegible] steam rolling, for the ensuing year:—The Rose Hill Stone Breaking Company and surveyor:—

Granite.—Groby Granite Company, Groby, near Leicester, 14s. 7d. per ton.
Rolling.—W. C. Symonds & Son, Saltash, Essex, 9s. 6d. per day.
Flints.—Keeble Brothers, Maldon, 6s. 6d. per cubic yard.

PRESTWICH.—Accepted for the construction of a storm-water drain, tube sewers, and manholes, for the urban district council.—Mr. S. H. Morgan, engineer:—

A. & S. Hyslop, Manchester.

(Subject to the sanction of the Local Government Board being obtained to proceeding with the work at the present time.)

SCUNTHORPE.—Accepted for the supply of materials for the rural district council.—Mr. A. Culkin, surveyor:—

Whinstone.—Ord & Maddison, Limited, unbroken, 9s. 6d. to 10s. 7d. per ton; Ord & Maddison, Limited, 2-in. machine broken, 11s. 6d. to 12s. 7d. per ton; 2-in. machine broken, 11s. 9d. to 12s. 7d. per ton. Lunedale Whinstone Company, 2-in. machine broken, 9s. 6d. to 10s. 7d. per ton; 1½-in. machine broken, 9s. 6d. to 10s. 7d. per ton. E. Summerscale & Co., 2-in. machine broken, 9s. 6d. to 10s. 7d. per ton. Brookes, Limited, 2½-in. machine broken, 11s. 6d. to 11s. 7d. per ton. H. Mead & Co., 2½-in. machine broken, 11s. to 12s. per ton. Shap Granite Company, 1½-in. machine broken, 11s. 5d. to 12s. 7d. per ton.
1½-in. Tarred.—Cradock, Allison & Co., 15s. 2d. to 16s. 9d.
¾-in. Screenings and Dust.—Mountsorrel Granite Company, 13s. to 13s. 3d.
Asphalt.—Lunedale Whinstone Company, 14s. 6d. to 15s. 10d. Reserves—Ord & Maddison, Limited, 15s. 6d. to 16s. 7d.; Slag and Tar Macadam Company, [illegible] to [illegible].
Dry Slag.—H. Mead & Co. (2 in. to 3 in.), 6s. 8d. to 7s.; (2 in.) 6s. to 6s. 3d.
Tarred Slag.—Slag and Tar Macadam Company, 14s. to 16s.; mixed sizes, 14s. 6d. Reserves—H. Mead & Co., 12s. 9d. to 13s. 4d.; Hull Roadstone Company, 13s. 9d. to 14s. 6d.
Tar.—T. Ness & Co., 3¾d. per gallon, stations. Reserve—G. Hardman, Son & Co., 3¾d., less 2½ per cent discount, works.
Land Gravel.—G. M. Prescott, pit, 2s. 3d.; roadside, 3s. 11d. to 6s. M. M. Dunn, roadside, 4s. 6d. to 5s. 6d.
Hornsea Gravel.—C. H. Saxelbye, 5s. 7d. to 6s. 3d.
Brushes.—Hadden & Co., Limited, 16-in. scavenging brooms, 18s. per dozen; horse sweepers, 6s. per brush. Rookledge & Son, 16-in. scavenging brooms, 25s. per dozen; horse sweepers, 50s. per set of six.
Shovels and Spades.—J. S. Kaye & Sons, [illegible] per dozen; shovels, 19s. per dozen.

STILLY.—For building a pumping station and works, for the urban district council.—Mr. W. H. Cousins, surveyor:—

Contract No. 1: Engine-house.—Ford & Sons, Cheddar, Somerset, £78.
Contract No. 2: Steel Tower.—H. Brown & Co., Bristol, £92.
Contract No. 3: Pumping Plant.—H. Brown & Co., Bristol, £281.

ICKFIELD.—For the erection of a retaining wall and parapet wall at Crowborough, for the rural district council:—

J. Jarvis, Limited, Tunbridge Wells	£118
Connor Brothers, Crowborough	117
D. Wickens, Crowborough	[illegible]

MEETINGS.

[illegible] will oblige by sending early notice of [illegible] of meetings.

APRIL.

23.—Institution of Municipal Engineers: Visit to London New County Hall Works. 2.30 p.m.
27.—Institution of Civil Engineers: Annual General and Special General Meetings of Corporate Members. 8 p.m.
28.—Royal Sanitary Institute: Dr. W. Perrin Norris, chief medical officer, Medical Bureau, Commonwealth of Australia, on "The Evolution of Hygiene and Public Health in Australia." 5 p.m.
30.—Institution of Municipal and County Engineers: Metropolitan District Meeting at Westminster.

MAY.

8.—Institution of Municipal and County Engineers: Meeting at Scarborough.
28.—Institution of Municipal and County Engineers: North-Western District Meeting at Northwich.
29.—Institution of Municipal and County Engineers: Council Meeting.
29.—Royal Sanitary Institute: Meeting at Shrewsbury. Discussion on "The Value of Mechanical Filters in the Purification of Water." 7.30 p.m.

JUNE.

4-5.—Institution of Municipal and County Engineers: Scottish District Annual Meeting at Ayr.
7.—Institution of Municipal and County Engineers: Meeting at Matlock.
24-26.—Institution of Municipal and County Engineers: Annual General Meeting.
25.—Mr. Herbert Samuel opens the National Road Exhibition.

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. APRIL 30, 1915. No. 1,215.

Minutes of Proceedings.

The Royal Commission and the New Central Authority.

The work of the Royal Commission on Sewage Disposal has occupied seven years, and during this period, it may surely be said without disrespect that the officers of the commission have received an education. If some of the statements in earlier reports drew forth severe criticism from the experts, it is to be gathered that the final report meets with better approval. When, however, one considers the immense amount of research work, the unusual opportunities of gathering experience, and the careful records kept of the results of work, it is apparent that the officers of the commission are now qualified in an unusual degree, not so much to write, a final report upon a subject which admittedly requires further investigation, but to continue their investigations. Who else could hope to do the work so well? The appreciative comments which have appeared recently in these pages, coming from those who are recognised authorities upon the subject, are worthy of particular attention, as they bear eloquent witness to the excellence of the work done and to the need for its continuance. If the facts stated by Mr. John D. Watson, chief engineer to the Birmingham, Tame and Rea District Drainage Board, in his "appreciation" of the work of the Royal Commission, were more generally understood, we should have a much clearer grasp of the present condition of affairs. Mr. Watson says that "there are hardly two sewages alike, and that even in the same town the leading characteristics of the sewage change as the town develops;" also that "no one who understands anything of the subject of sewage purification can honestly say that the problem has been solved." More than ever Mr. Watson is of opinion that each case needs the most careful consideration on its own merits, and he urges the importance of the establishment of a central authority provided with the means of carrying out research work on the same lines as that of the Massachusetts State Board of Health. Major Arthur J. Martin is of the same opinion, for he tells us that the "Final Report leaves many a vexed question unsettled," and that "the most important recommendation of the commissioners is designed to guard against the policy which has proved so disastrous in the past by the establishment of a central authority competent to keep our practice in the disposal of sewage and trade wastes abreast of modern progress;" he further is of opinion that, notwithstanding the fact that the times are not propitious for legislation, "Parliament might well spend a little time in giving effect to the commissioners' recommendation."

It is interesting to note how clearly Mr. A. P. I. Cotterell, the president of the Institute of Sanitary Engineers, follows the same idea. To make any hard and fast rule applicable to all cases is, he considers, clearly out of the question, and he strongly commends the recommendations of the commissioners to make the degree of purification dependent upon the character of the stream into which the effluent is to be discharged. Mr. Cotterell's statement that, "after all, to make the work to be done commensurate with the conditions to be met, and not with a hard and fast rule that makes no difference between evil and good is what we engineers are constantly striving to do," will be applauded by all those who have a real knowledge of the subject. Mr. Cotterell also very justly points to the fact that new sources of pollution will from time to time occur, also that the conditions at existing sources will necessarily change. "It makes one wish that the research work developed by the Royal Commission should not be allowed to drop upon their departure." Again, Mr. H. Gilbert Whyatt, the borough engineer of Great Grimsby, evidently holds the same idea—namely, that, as the result of the Royal Commission's work, we have for ever escaped the binding rules by which one method of disposal was held to be necessary for every kind of sewage. He, as one of the pioneers of reform, formerly urged that "the Local Government Board should be roused from its state of agnostical immobility"—that was in the day when land treatment was considered a *sine qua non*. It is now established "that the available methods of sewage purification are as diverse as the sewage itself; and we know the sewage of any ordinary town varies from hour to hour during the day." Mr. Whyatt does not, however, like all the other commentators, suggest the need for continued research work by the central authority, but this is probably due to the brevity of his comment, and it almost follows as the logical outcome of his remarks that he should be in agreement with the suggestion that the work—which has wrought such a beneficial change; and of which he was

formerly so powerful an advocate before the Royal Commission took the work in hand—should be carried on by the central authority without breaking the sequence of the operations. "The bars to progress would seem to be, in the first place, obsessions of various sorts—scientific, professional, and administrative—and, secondly, the striving for standardisation, which eventually becomes another name for stagnation," says Dr. Gilbert J. Fowler, and the reader may well understand how abhorrent the idea of settling down to the "comfortable belief that the Royal Commission has reported and all is now well" must be to one possessing the acute reasoning power and scientific ability of Dr. Fowler. He again demonstrates very clearly that continuous research work is necessary. We have reached a stage when, "at considerable expense and trouble, it is now possible, in the majority of cases, to obtain fairly satisfactory effluents, although not infrequently a nuisance is transferred from the river to the air, where it takes the form, not only of smells, but of flies and other noxious insects. The sludge problem is still unsolved." Clearly it is no time for standardisation or for a relaxation of effort.

It is clear that there is general agreement among the authorities quoted above, first, that the work of the Royal Commission, though admirable and useful, merely shows more clearly than ever before that original thought and treatment are required invariably in designing and working sewage disposal works, because the conditions must of necessity vary in every case, and what may be necessary, suitable and economical in one case may be unnecessary, absurd or wasteful in another; also that because the problem is by no means fully solved, and because of altering conditions, changes and progress, it is very necessary that the work started by the Royal Commission should be continued, and that for this reason a central authority should be created with the least possible delay. Further, we would urge, in order that the sequence of operations may not be broken, that those who are now qualified by their long experience should continue their work without a break as officers of the new central authority. If this is not done, it is obvious that an immense amount of the work done will be lost, or will have to be gone over again.

* * *

The Government and Road Board Grants.

At last week's meeting of the Gloucestershire County Council a most important resolution in regard to the distribution of Road Board grants for 1914-15 was moved by the Earl of St. Aldwyn. The resolution, which was carried unanimously, was in the following terms: "That this council protests against the requirements of the Treasury that the Road Board should make it a condition of a grant towards the improvement of certain roads that they should be satisfied as to the adequate maintenance of other roads towards which they have made no grants. That the Road Board grant of 1915-16 towards the scheme previously sanctioned by the Road Board for the use of improved materials upon the more important main roads in the county ought not to be largely reduced in order to relieve Parliamentary votes for war purposes at the cost of the road improvement fund from the charge of remaking roads destroyed by military traffic." It will be observed that the resolution deals with two matters—namely, the imposition by the Treasury of conditions in accordance with which grants by the Road Board are to be made, and the use of the funds of the board for remaking roads which have been destroyed by military traffic. In regard to the first matter, Lord St. Aldwyn pointed out that, under the Act by which the Road Board was constituted, the power of deciding upon any conditions to be attached to grants was vested in the board, and he contended that the action of the Treasury in the present instance was *ultra vires*. The avowed reason for the imposition of the condition complained of is to secure such a diminution in the ordinary grants as will provide a fund for remaking roads destroyed by military traffic. The result is that an item of purely war expenditure, which ought to be met by funds provided by the taxpayer, is in fact to be met out of a fund allocated by Parliament to the relief of the ratepayer. Moreover, as Lord St. Aldwyn further observed, the fund in question was specially provided from the motor-car and motor spirit duties to make or improve roads, and as the law now stands it cannot be touched for any other purpose. There appears to be good reason for the strong protest made by the Gloucestershire County Council, and inasmuch as copies of the resolution were ordered to be sent to the other county councils, it is probable that a good deal more will be heard of the matter. The County Councils Association, we note, had the question before them at their meeting on Wednesday, in London, and adopted a motion expressing disapproval of the Treasury's requirements.

* * *

Wombwell Surveyor and the Urban Councillor.

One of the local councillors who are in the habit of working themselves into a fury of excitement over financial matters, and, while in this heated condition, making statements that, to put it mildly, are difficult to prove, had rather a nasty fall recently at Wombwell. The gentleman in question, a member of the urban district council, issued an election address in which, referring to a particular work of sewerage carried out by the council, he made a cryptic allusion to "experiments having to be tried at any cost," and proceeded to allege that the contract, which a certain contractor offered to carry out for £1,100, had eventually cost £3,000. The surveyor, Mr. W. Quest, being professionally concerned as an official of the council, received the consent of the Sanitary Committee to reply to the statements made, and, in a clear, business-like speech, tempered with the spirit of sweet reasonableness, he was able to blow to the winds the suspicions that may have gathered around the election address if it had been allowed to go unchallenged. In the first place, there were no experiments to be tried either "at all costs" or by way of voluntary observation. In the next place, the scheme, which was carried out in its entirety by the Sanitary Committee, proved a particularly troublesome one, seeing that it included an unexpected difficulty in dealing with a large quantity of water, the bankruptcy of the contractors, and certain difficulties with another contractor involving the completion of the work by the council themselves. Finally, it was completed in fifteen months instead of two years as alleged by the councillor, and the nett cost was £2,498 in place of £3,000. The dissatisfied councillor, who, it is only fair to say, disclaimed any intention of referring to the surveyor—in his reply remarked that he would look carefully into the list of particulars to see that everything was put into the sewer as stated, which is suggestive of the inverted policy, Judgment first, then inquiry. The upshot was that the council passed, *nem. con.*, a vote of confidence in the surveyor, and the councillor was left to reflect upon the wisdom and utility of the adage which commends us to verify our references.

Professional Charges.

The recent issue by the Council of the Institution of Civil Engineers of an official statement in regard to the vexed question of professional charges will be generally welcomed by engineers. At the same time, as a step towards the establishment of a uniform basis upon which fees may be fixed, the statement should prove very serviceable to clients. The council has wisely refrained from laying down rigid rules to be applicable to all the varying circumstances of different cases. Indeed, it is expressly stated that engineers with larger experience command fees on a higher scale than younger men with less experience, and that the general rule laid down for remuneration at the rate of 5 per cent. upon the cost of works is liable to be varied in accordance with the nature and magnitude of the undertaking and the character of the services rendered. The preparation of bills of quantities, payments to resident engineers and inspectors, and personal travelling expenses are not necessarily to be regarded as included in the fees paid, and may be made the subject of special arrangement. An interesting part of the statement is that which deals with the respective rights of the engineer and client in plans and specifications prepared by the former. On this matter counsel's opinion has been taken, and he advises that plans and specifications prepared by an engineer belong, as chattels, to the client, after payment of the agreed fees; but the copyright in all original matter contained in such plans and specifications remains vested in the engineer. Neither the client nor any other person is entitled to multiply copies of plans and specifications so far as the original matter therein contained is concerned, and, further, if such original matter has "an artistic character or design" the plans can only be used for the purpose of the particular structure for which they were prepared by the engineer, or for such other purpose as he may authorise. Original matter in specifications is defined by counsel to be a composition or arrangement of the author—something which has grown up in his mind, and would, if applied to patent rights, be called invention.

* * *

School Building and the War.

The restrictions which have been imposed by the Treasury on borrowings by local authorities during the war, coupled with the present necessity for economising labour, are being felt in many directions. It is greatly to the credit of all concerned, however, that the inconvenience which necessarily results is being loyally and cheerfully borne as an incident of the exigencies of war. We have already referred to the two circulars on these subjects issued by the Local Government Board, and we now learn that the Board of Education has addressed to local education authorities a circular with regard to a temporary restriction of expenditure on the provision and improvement of school buildings. This circular contains some very useful suggestions in regard to administrative action which may be adopted by the authorities during the lull in the execution of structural works, with a view to the speedy resumption of school supply when the crisis is over. In the first place, each authority is invited to make a careful survey of the area under its control, with special reference to the supply of and demand for school places. Then again, where new or improved schools appear to be necessary, preliminary formalities can be completed, and plans can be submitted to the board. These will be considered and approved in the usual way, after consultation with the Local Government Board; but, of course, any estimates of cost submitted with them will necessarily be provisional, and the actual sanction of a loan by the Local Government Board will be deferred. Finally, as regards the acquisition of sites, where it appears that a suitable site may be lost or may rise in price if not secured at once it will be open to the local education authority, if the proposal is approved, to secure the site by means of a lease with an option of purchase.

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Design of Quay Walls.

At the last meeting of the Concrete Institute a very interesting paper on "The Stability of Quay Walls on Earth Foundations" was read by Mr. F. E. Wentworth-Sheilds, M.INST.C.E. The peculiar difficulty in the design of these structures arises from the fact that, being necessarily founded as a general rule upon a soft material, they are always in danger of failure by a sliding forward of the whole work on its base. This circumstance, together with other inherent uncertainties, renders it exceedingly difficult to balance due safety with a proper economy of material. The object of Mr. Wentworth-Sheilds' paper was to consider the uncertainties and difficulties which the designer of a quay wall has to face, and, if possible, to ascertain how far calculations can assist him, and how far he must trust to judgment based on experience. The conclusion arrived at was that, although calculations cannot always be relied upon, they should not be entirely ignored. On the contrary they are most useful in suggesting means for increasing in the most economical manner the stability of designs which are known or suspected to be weak. The purely mathematical design is, however, impossible, and a sound judgment is therefore a matter of first-rate importance. How can such a judgment be formed? The engineer must, of course, rely primarily upon his own experience. In addition to this, Mr. Wentworth-Sheilds suggested that it would be most useful if careful records of both successes and failures in this class of structure could be kept and published. We agree that if the Concrete Institute could see their way clear to undertake this work, they would be rendering a real service to those engineers who have to design these specially difficult structures.

* * *

Risking a Surcharge.

Notwithstanding the refusal of the Local Government Board to give their sanction to a grant promised by the Maldens and Coombe Urban District Council towards the cost of a new rifle-range for the local volunteer training corps, the matter was further discussed at the last meeting of that body. One member urged that, in view of the excellent work accomplished by the corps, the council should make the grant in spite of the attitude adopted by the board. The whole discussion appears to have proceeded upon the assumption that if the grant were made, and the amount surcharged by the auditor, the loss would fall upon the council as a body. Those who have had practical, and perhaps bitter, experiences of surcharges, however, are aware of two things. In the first place the surcharge is made, not upon the council as a body, but upon the individual members who sign the cheque; while, in the second place, if the illegal payment is made wilfully and with knowledge of its illegality, the chances of a remission of the surcharge are comparatively small. After all, the council are the trustees of public monies raised for specific purposes, and the refusal to make a grant, even for so excellent an object, argues no lack of patriotism. What, asked one member, would a surcharge of a mere £25 be among a body of men such as constituted the council? We venture to suggest that all difficulties might be overcome, and the promise made by the council be redeemed, by raising the sum by voluntary subscription.

Urban and Rural Housing.

By REGINALD BROWN, M.INST.C.E., M.I.MECH.E., F.S.I., Engineer and Surveyor to the Southall-Norwood Urban District Council.

[On Monday evening further discussion took place on the two papers based on the report of the Land Inquiry Committee which Mr. R. Strachan Gardiner and Mr. C. S. Joseph read at a meeting of the Surveyors' Institution held on the 12th inst. Mr. Brown was among the speakers at Monday's meeting, and in the course of his remarks touched upon the essential points of the subjoined communication.]

No matter the source that gives rise to a discussion on housing, the subject is of such complexity and its consideration must be from so many points of view that there is room for all shades of opinion; but we, as an institution, have to look at the matter from its very broadest standpoint, and also from a constructive and not from a destructive point of view.

Mr. Joseph, in his paper on Urban Housing, summarises the main principles of the committee's report under three heads. First, he states that a large proportion of the population occupy overcrowded and insanitary dwellings, and the reason given is the scarcity of suitable accommodation at a reasonable cost. While all of us will probably agree that too many of the population occupy dwellings which, to say the least, are not ideal, much of the overcrowding and insanitation which exist are largely due to the occupiers themselves, and I am afraid it will always be so until the particular class occupying such dwellings have been educated to treat the houses they live in with the same care as they would do if they had to pay for all repairs and cleansing caused by their own negligence. There is too much at the present day of the shifting of responsibilities from the occupiers to the owners. The genuine working man and woman take a pride in their little home, and it seems very hard that these "will be's" should be compelled to live alongside the "won't be's."

I think that the London County Council and certain of the public utility societies have shown that decent accommodation can be provided at reasonable rents even in the more thickly populated parts of the Metropolis. The supply of such accommodation may not be equal to the demand, but the reasons why this is so should be tackled at the very roots, and not continue with aggressive legislation to make the supply still less than it is now. The Inquiry Committee concludes that three things militate against the supply being maintained, and I wish briefly to touch upon these three headings as set out by Mr. Joseph.

THE LACK OF HOUSES.

The first is the "high cost of land." One cannot help agreeing with the author that too much importance is attached to this item. I find that the London County Council, in their Parker-street House, Drury-lane, expended just under £11 per head for the site, while the cost of their Carrington House, Deptford, per head was about £2 15s., and that of Bruce House, Clare Market, about £12 10s. per head. To those who know, these prices bear a small proportion to the rental. Again, in the outlying urban districts, with twelve houses only per acre, and with the land at £600 per acre, the rent due to land is only 9d. per week, which sum is, of course, reduced if the number of houses per acre is increased, or the land lower in price; 1½d. per week per house per £100 per acre may be taken as a fair basis of calculation for twelve houses per acre.

The second reason given as militating against the supply of houses is rates. Now rates are, or should be, paid by everybody, and, what is more, each class of individual should bear an equal proportion. The poor-rate (made up of education, county council rates, police and poor relief—I am speaking of Extra London) and the district-rate put together, as paid by the lower-rated houses, do not at present cover the cost incurred on their behalf; hence it is difficult to see how these can be reduced. The constant upward tendency of rates ought to have serious consideration; but again it is necessary to go to the root, and not try to shift the rates, which ought to be paid by everybody, on to the shoulders of the few. Mr. Joseph has pointed out certain difficulties created by authorities refusing to "compound," but there is something to be said on both sides. Payment on full assessable value does not always mean that the total amount paid in rates would be less, although the rate in the £ might be less; or, again, where compounding is in existence the rates may be higher than in those districts where non-compounding is in force. It seems, then, that no rule can be laid down as applicable to or advisable for all districts.

We now come to the third reason—the local by-laws. To the minds of some people building by-laws are a bugbear; they are the cause of increased and unwarranted cost in building. Believe me, such a statement is not well founded, and I speak from a good many years' experience of their administration.

REMEDIES FOR SHORTAGE.

We next come to the remedies to be applied, and these may be summed up in—Building by local authorities; public utility societies to be assisted financially; promotion of transit schemes and improvement of existing property. I will only deal with the first two.

Why societies and not local authorities should be assisted financially I fail to see, and why, if financial assistance is to be afforded at all, it should not be afforded to everyone who complies with specific requirements. This principle has been followed in the Housing No. 2 Act so far as local authorities are concerned, by which they may receive a 10 per cent free grant under certain conditions; but why penalise private enterprise in this way? Private builders who cater for working-class houses are surely entitled to the same consideration—subject them to limited profits, if you like, and see that suitable houses are erected and maintained by them, but do not drive them out of the market by unfair competition. There is room for all private enterprise, public utility societies, and local authorities.

Now let me turn for a few moments to rural housing and Mr. Gardiner's paper. First, let me say that the suggestion of teaching hygiene in schools has, I think, the earnest approval of every person interested in housing. It is a suggestion which I, and many others, have advocated over and over again; but how to fit in such teaching in the ordinary school hours is one for the Education Department to settle. Some of the points raised by Mr. Gardiner are as follows: The shortage of houses to be made good, the housing of the poorest is the problem to be faced, the main difficulty being the cost. Private enterprise is prevented from building cottages because the labourer cannot pay an economic rent, and the suggestion that for the housing of the poorest the remedy is for either free grants or the raising of wages. Mr. President, I do not wish to labour the question more than is necessary, but I cannot forbear, with your permission, dealing with a solution of the housing problem put forward by me in 1913 at the conference of local authorities on housing, held at Yarmouth and many other places since that date.

THE FINANCIAL ASPECT.

The financial aspect of the question is the most important point for consideration, especially when it is borne in mind that no charges should fall on the general ratepayer, but that each scheme should in itself be self-supporting, so far as the district is concerned. In carrying out schemes I would suggest that definite maximum rents be provided for, and a maximum wage of 27s. per week in urban districts and 18s. in rural districts form a basis. The rent, calculated on the one-sixth basis, would then be 3s. in rural districts and in urban districts 4s. 6d. per week—the one-sixth basis being one day's pay to go in rent.

I start with the principle that some provision must be made for assistance to local authorities and others on behalf of those whose families require greater accommodation, as the larger the families the greater the accommodation required, and the less the bread-winner has to spend on house rent. How is this to be met, and how is the assistance to be afforded? One way in which the solution of the problem could be assisted would be the extension of the period of the whole of the loan to eighty years, instead of splitting it up into periods of

eight years for land, sixty for buildings, and forty in roads and sewers. This above would reduce the rent to about 8d per week and as the [illegible] could be carried out in good conditions, and the economies that already been made in the rents for such [illegible], it is difficult to see why this could not be carried out. I do not think it at all [illegible] and I am therefore not in agreement with Mr. Gardiner on this point. To do this would be a further penalty [illegible] and to [illegible] of private individuals. I have previously stated [illegible] part the gains [illegible] property.

From careful estimates of the cost of buildings [illegible] Government Board, and from which I am not at present prepared to depart, in normal times I am convinced that, with efficient administration and [illegible] rents. I estimate that with land at £100 per acre, with twelve houses per acre, and in urban districts, [illegible] families up to those of five children at rents varying from 4s. 10½d. to 7s. per week, and in rural districts under the same conditions, but with country gravel roads [illegible] per week. [illegible] per acre.

ACCOMMODATION.

As to the accommodation to be provided this depends upon the number of children at non-earning ages (say up to fourteen years), and I think all will agree that as the birth-rate is more a national than [illegible] Exchequer might well be asked to pay something towards what is a national [illegible] the children especially in the case of those who, owing to low-wage earning capacity, can afford but little out of their wages for rent. This principle has already been adopted in the case of those who within the [illegible] limit, where a rebate of £10 per annum (7s. 6d.) is allowed for each child under a certain age; so that the question is no new one. It is, of course, necessary to look at the question broadly and carefully, [illegible] come from somewhere. A simple solution would be [illegible] per week, to be paid direct to the local authority, or other bodies, or individuals erecting houses under specific conditions, and by them deducted from the rent to be charged, according to the accommodation provided in the houses erected by them and utilised. If such a system was adopted, it would mean that, taking the larger house referred to by me and fixing the rent at 7s. per week, and allowing that five children could be provided for, we get the rent payable by tenant, 4s. 6d.; National Exchequer, 2s. 6d.; total, 7s. and in the smaller house, on the same basis, with accommodation for one child, we get—paid by tenant, 4s. 4½d.; National Exchequer, 6d.; total, 4s. 10½d. Of course in the case [illegible] would have to be made that preference be given to those earning 27s. per week and under, the lowest paid and the largest families having the preference and also that if a person wished to occupy the larger type house, with, say, no children, then he should pay the whole 7s.; if one child, 6s. 6d.; if two children, 6s., and so on, with a minimum of 4s. 6d. per week, and the maximum number of children to be allowed for in the grant being five, the difference being made up by the National Exchequer. The same principle could apply to rural districts, where a cheaper [illegible] is required owing to the lower wages. Thus, taking my estimate of 4s. per week for the smaller type house, the Exchequer allowance would be 6d., leaving 3s. 6d. for the tenant; while for the larger house the Exchequer would pay 2s. 6d., leaving the tenant to pay 3s. 1d. per week.

By adopting such a method the grant from the National Exchequer to local authorities would be applied on an equitable basis. My suggestions, therefore, to facilitate the erection of houses for the working classes embody the following points for consideration

(1) Houses only to be erected, in the first instance, for those whose wages do not exceed 27s. per week.

(2) That preference be given, in letting the houses, to those receiving the lowest wages, and with the largest families.

(3) That proper regulations be made to ensure the full occupancy of the houses erected, or the tenant to pay rent according to the number of his family of non-earning ages.

(4) That the period of loan should be eighty years for land, houses and roads.

(5) That the National Exchequer should make grants to local authorities and others based on the number of non-earning-age children for which accommodation is provided and actually utilised.

I claim that by some such method as this houses could be erected so as to let at reasonable rents within the means of all workmen, and, in addition, some encouragement would be given for the increase of the birth-rate, and so delay the arrival of the period of racial bankruptcy—when the birth-rate is equal to, or below, the death-rate.

THE SOUTHALL-NORWOOD SCHEME.

In conclusion, I would like to give a few particulars of a scheme designed by me, and which would have been carried out if the war had not arisen.

I was instructed by the Southall-Norwood Urban District Council in 1914 to report upon sites for housing, and submit a scheme for their consideration, as they had received orders from the Local Government Board to proceed with a scheme owing to shortage of houses in the district. The detail of a good many sites were gone into, and at last it was decided to purchase a site of about 9 acres—a site admirably adapted for such a scheme, it being triangular in shape and bounded on two sides by parish roads. The land cost £500 per acre. My ideas on housing being to limit the number of houses per acre, I decided that ten houses per acre should be the number, and hence submitted a development showing ninety houses. My reasons for doing this were to limit the road-making charges to the lowest possible, and it may be interesting to know that a fuller development of the estate, while permitting a larger number of houses per acre, would have entailed charging higher rents to make the scheme self-supporting.

I am strongly of opinion that with careful development a low limitation of houses per acre does not in any way entail higher rents. In addition to this, the limitation of the number of houses has the very great advantage of securing more air space. I am not one of those and I am glad to see that Mr. Gardiner is in agreement with me- who believe that the whole of the vacant land on a building estate should be utilised as gardens for the separate houses, because it is not all the tenants who are keen on gardening, and one badly kept garden has a very deleterious effect upon adjoining gardens. I would rather see a small garden for the use of each house, divided by as few fences as possible, and those very low ones, and devote the remaining area as open spaces maintained by the authority out of the rates or let as allotments to those of the tenants who desire such accommodation.

It was [illegible] that my design was based, and for the information of the members the secretary has kindly hung certain of the drawings of the scheme on the walls of this hall. The block plan shows the scheme as a whole, with the space at the rear laid out as a public garden, and the spaces in front of the houses, built in quadrangular form, and also in front of one of the blocks were to be laid out in a similar manner. The scheme is arranged so that almost all the houses should overlook the open space at the rear, and have easy access thereto. It was decided to proceed, as a first instalment, with forty-two of the houses, together with twelve houses in another part of the district. The other plans exhibited show the accommodation to be provided in the various types. My estimate for building these fifty-four houses, with fencing, &c., amounted to £12,675. Some considerable delay was, however, unavoidably occasioned, and it was not until just before the war that tenders were invited for the work. These tenders, on my recommendation, were obtained on the basis of direct purchase of materials, and letting the labour by contract in the several trades, and it was of considerable satisfaction to me to find that, although the war had given rise to a large increase in the cost of certain of the building materials, the expenditure, even if carried out at such abnormal times, would have only been an average of £13 per house more than my estimate. As the increase in prices of materials accounted for at least £22 per house, it is obvious

that in normal times the estimate would have been a very fair one. The rents to be charged for the houses were as follows: Classes A and B, 6s. and 6s. 6d.; classes C and D, 7s. and 7s. 3d.; classes E and F, 7s. 6d. and 8s., the income balancing the expenditure. Unfortunately, owing to the war, the Local Government Board has stopped all such schemes, and hence the carrying out of the scheme has been postponed.

I must thank the members for their forbearance in permitting me to speak at such great length, but the subject is of such paramount importance that any suggestions made for solving the problem ought to receive due consideration.

HOUSING AND TOWN PLANNING.

LONDON COUNTY COUNCIL AND A PROPOSED CONFERENCE.

In a report submitted to the County Council on Tuesday the Building Acts Committee of that body stated that they had had under consideration a resolution of the council passed in December last that it be referred to the committee to report as to the advisability of the council calling a conference of the local authorities in the neighbourhood of London to discuss joint action in town planning under Part II. of the Housing, Town Planning, &c., Act, 1909. The committee reminded the council that the President of the Local Government Board had summoned six sectional conferences, each to consider the question of arterial roads and the relationship of these roads to town planning, so far as concerned the six sections into which for the purpose Greater London had been divided. One hundred and thirty-seven authorities in Greater London were represented at these conferences. The conferences had met and sub-committees had been appointed to collect information, but no definite decisions had been arrived at. The question of town planning was so intimately associated with the question of arterial roads that it appeared to them that no useful purpose would be served in calling a conference to discuss the question of town planning until some definite decisions had been arrived at with regard to the question of providing arterial roads, or at least until some further progress had been made in that direction.

The committee pointed out that there was also the financial aspect of the proposal to be considered. If the council were to call a conference, as suggested, it must be assumed that the council would be prepared to meet any expenditure which might have to be incurred in connection with any schemes for dealing with areas in London which might be put forward as the result of the conference. They believed, however, that the council did not wish at the present time to do anything in furtherance of schemes which might possibly involve them and other authorities in heavy expenditure, and they accordingly recommended that the reference of December last be discharged.

Surveyors' Institution. The Special Diploma examinations in sanitary science, forestry and surveying will not be held this year, the entries having been insufficient.

London District Surveyors. The Building Acts Committee of the London County Council report that they have consented, under sec. 142 of the London Building Act, 1894, to the appointment of a deputy district surveyor in four cases. They have appointed one interim district surveyor under sec. 139, and one special district surveyor under sec. 144.—The district surveyorship for the district of Greenwich and Woolwich became vacant on April 8th, by reason of the retirement of Mr. Alfred Conder. The gross receipts from the district during 1914 amounted to £1,658, of which the Greenwich portion of the district yielded £1,112, and the Woolwich portion £546. In view of the large receipts the Building Acts Committee have divided the district into two districts, the dividing line being the borough boundary. They will report in due course as to filling the vacancies, and in the meantime have appointed Mr. Conder interim district surveyor until the date upon which his successors will take up their duties.

ACCUMULATOR-PROPELLED VEHICLES.

"PHENOMENAL PROGRESS."

Mr. R. J. Mitchell, in a recent lecture before the Junior Institution of Engineers, said the progress which the petrol vehicle has made during the past fifteen years had obscured the fact that on the Continent of Europe, and more particularly in the United States, an immense advance in quite another line of commercial carrying had been made in the use of accumulator-propelled commercial vehicles.

In the States the growth of the electric type had been phenomenal, and the secretary of the Electric Vehicle Association reported that there were now in operation in the American Union nearly 75,000 accumulator-propelled vehicles.

Immense improvement had been made on the mechanical side during the past fifteen years, and the modern electric represented a high degree of refinement as regarded all its fundamental details. These improvements were largely due to the work of the regular automobile engineer, who had made available frames, axles, bearings, steering gear and transmission of unexampled excellence—in fact, of almost unimprovable durability. The electrical engineer, on the other hand, had contributed his quota, and accumulators, electric motors and controller, and so forth, were rapidly nearing perfection; in fact, it might be said that, for practicable purposes, the modern electric vehicle would remain an exceedingly useful machine were it not improved for the next twenty years.

The advantages of the electric were manifold, and included very low cost of operation, a safe speed, very slight damage to road surfaces, great handiness of operation, occupation of little floor space, total absence of fire risk, smoke and smell, and the fact that they could be driven by relatively unskilled labour, with a minimum of tuition.

Showing the economy of the electric from a fuel-consumption standpoint, it should be mentioned that an average machine would give the equivalent of 4 gross ton-miles of work for one unit input of energy. This compared exceedingly favourably with the 30 to 35 ton-miles of energy in commercial work obtainable from a gallon of petrol only on a very well tuned commercial petrol chassis.

The mechanical wear and tear of the electric was infinitesimal as compared with that of an internal combustion machine, and an average figure appeared to be about a quarter of 1 per cent per 1,000 miles of travel, on the initial capital cost of the chassis only.

High speeds in heavy traffic were much to be deprecated, for it should be borne in mind that not only did they cause the unnaturally rapid wearing out of the chassis, but also extensive damage to road surface, and at a rate probably in proportion to the square of the speed.

Tyres for electric vehicles had a specially long guarantee, and in actual practice far outlasted the terms of the warranty.

The modern accumulator had reached the point of being entirely dependable, and in the case of the Edison all-steel alkaline accumulator, a guarantee of four years, enabling the user to depend on at least 100,000 miles service, was available.

The price of electrical energy had come down from a figure sometimes as high as 1s. a unit to an average of 1½d., or thereabouts. Moreover, there were to-day nearly twice as many electricity supply undertakings, thus making it quite practicable to tour over the country on an accumulator automobile.

Drawing Office Requisites.—We have received a copy of the latest catalogue of Messrs. J. Halden & Co., Limited, 8 Albert-square, Manchester. The new list is much the most comprehensive the firm have issued. Many goods find space in it for the first time, and in a variety of ways information has been extended and amplified, while prices have in some cases been reduced. The catalogue is divided into five sections: (*a*) Drawing instruments; (*b*) surveying instruments; (*c*) drawing office sundries, (*d*) drawing office furniture; (*e*) engineering photography; and each of these section lists—which are as tastefully produced as the complete catalogue—is issued as a separate booklet for convenience of reference.

A WIGTOWNSHIRE FERRO-CONCRETE BRIDGE.

Mr. D. H. Robb, engineer to the Machars District [illegible] Wigtownshire, has designed a bridge [illegible] Mochrum Hill [illegible] Some time ago Mr. Robb found it necessary to report to the Wigtownshire County Council that the old Black Burn Bridge was unsafe for traffic in the Black Burn, in Wigtownshire.

Black Burn Bridge before Widening.

[illegible] of the heavy stone arch.

[illegible] struct the bridge, with the exception of the existing abutments and wing walls, as Mr. Robb came to the [illegible] paratively small weight of [illegible] the tender submitted by Messrs. [illegible] Limited, was accepted by [illegible] work was carried out under the supervision of and in accordance with the designs of the [illegible] working drawings were prepared by Messrs. L. G. Mouchel & Partners, of Westminster and Glasgow, who were represented during the execution of the contract by Mr. T. O. Dixon, their district engineer for Scotland.

With the object of consolidating the abutments, and of providing a solid monolithic support at each end for the ferro-concrete girders, the masonry was cut away so as to afford space for the [illegible] pad, 18 in. wide by 12 in. deep. The girder span comprises five ferro-concrete beams, 9 in. wide by 20 in. deep, connected by a continuous decking of the same material, 6 in. thick, the whole in monolithic connection. The two outer beams are continued up to form curbs for the roadway, and from them rise the ferro-concrete posts of the parapets on either side. The bridge, which has a clear span of 28 ft., allows a maximum opening for flood waters, and, while of unpretentious character, is perfectly harmonious with its picturesque surroundings.

Black Burn Bridge—View of Roadway.

Brass Pavement Rollers.—"M. A. C." asks for the names of makers of brass pavement rollers for cement work.

THE UPKEEP OF SURREY MAIN ROADS.

A [illegible] Committee of the Surrey County Council on the expenditure of the council, and have presented a report setting forth the following general conclusions [illegible]

As the result of careful consideration of the facts, your sub-committee have come to the following conclusions in reference to this branch of their inquiry:

(1) That, while motor traffic is still in a transition period, it has affected Surrey with severity.

(2) That the Road Board's figures, as given in their last report, issued in 1913, show that the weight of traffic at observation points [illegible] tionally heavy.

(3) That hard material for [illegible] be imported from other counties with heavy transit charges.

(4) That in Surrey the great arterial roads alone are main roads, so that the average cost per mile is higher than in counties where roads of less importance are included in the list of main roads.

(5) That the [illegible] throughout Surrey are kept generally in a satisfactory condition, and compare favourably with those in contiguous counties. The cost could probably be reduced, but this might involve a lowered standard of efficiency, which your sub-committee fear would not lead to efficient [illegible]

(6) That, in view of the Road Board's discontinuance of the grant of loans, it is a matter of satisfaction that the county council have not been committed, in reliance upon such loans, to the full capital expendi- [illegible] propounded by that board of carrying out extensive main road improvements.

Bridge Model at Royal Academy.—The model of a proposed new bridge across the Thames near St. Paul's Cathedral is to be seen at the Royal Academy Exhibition which opens at Burlington House on Monday. The model is from the drawings of Mr. C. Wontner Smith, and was placed fourth in the recent competition organised by the Bridge Committee of the City Corporation. The construction of this bridge at a cost of nearly £2,000,000 has been under consideration since 1909. The final design has not yet been accepted.

Corrosion of Iron and Steel.

DISCUSSION OF MR. W. J. E. BINNIE'S PAPER AT THE INSTITUTE OF SANITARY ENGINEERS.

We reproduced in last week's issue the valuable paper which Mr. W. J. E. Binnie, M.INST.C.E., F.G.S., presented at the meeting of the Institute of Sanitary Engineers held on the 14th inst. at Caxton Hall, Westminster. The reading of the paper was followed by an interesting discussion, for the subjoined report of which we are indebted to the courteous secretary of the institute, Mr. Hasluck.

Mr. H. Percy Boulnois (Westminster), past-president, in proposing a hearty vote of thanks to Mr. Binnie for his excellent paper, congratulated the institute on having secured Mr. Binnie as a Fellow, and for having had the opportunity of listening to his paper, which was a condensed explanation of a difficult and rather illusive subject. Mr. Boulnois was inclined to think there might be occasions in which, instead of going to the expense of treating water so as to prevent corrosion of mains, it might be more economical to occasionally scrape the mains with a machine. With regard to cast-iron pipes for sewage, he mentioned that the syphons into the docks at Liverpool had been in existence for upwards of eighty years, and were still perfectly sound, as a greasy film had coated them and thus protected them. As to remedial measures, he mentioned the Bower-Barff process, but concluded it could not be practically applied to pipes of large dimensions. He thought that some silicious coating on pipes might be found to solve the problem. He asked for some explanations of some of the terms used in the paper.

Sir William Ramsay, K.C.B. (hon. member), said that the "electrolytic theory" was merely a modern method of expressing the "acid theory" of erosion. The presence of acid is necessary to have the requisite concentration of hydrogen ions. Referring to the changes produced by water in motion, he threw out the suggestion that the attack might conceivably be due to difference in pressure, and therefore in concentration of the hydrogen ions of the water, due to its motion. The non-attack of sewage on iron was doubtless due to its alkalinity, which had the result of diminishing the number of hydrogen ions by combining them with the hydroxl ions of the alkali. He joined in congratulating Mr. Binnie on the very lucid expression of his subject, and especially on the fact that if the advice of those consulted had been taken a very great saving would have resulted.

Mr. H. F. Rutter, M.INST.C.E., said that he approached the subject of the discussion with some diffidence, as it was one of such great complexity that misconception might easily arise. Different conditions produced on the same material very discrepant results. It was quite clear that waterworks engineers were obliged, in some situations, to use steel pipes, as that was, for certain purposes, the only available material. He would, however, like the steel-pipe makers to understand that engineers were by no means satisfied with the durability of steel pipes as at present made, and that they used them because they had no alternative. Whether a solution of the problem would eventually be found in the direction of a perfect protective coating, or whether an incorrodible metal might hereafter be produced by alloying some other element with iron, he would not venture to predict. The extraordinary durability of cast-iron pipes had probably tended to cause engineers to hope for a longer life and more freedom from oxidation than steel pipes had up to the present afforded. Where the water conveyed was of a neutral character—as, for instance, in London—it became almost impossible to assign any limit to the life of large cast-iron mains. He had a year ago examined a 30-in. main laid in London in 1811, and found it both internally and externally in every respect as good as the day it was laid. The internal surface presented a black appearance, and was perfectly smooth except for a few scattered nodules, in no case more than ¼ in. in height. Thus the coefficient of friction was practically the same after 104 years' use as when the pipe was first laid. The pipes were, of course, made of cold-blast iron, and were not coated in any way. His experience seemed to show that the resistance to oxidation of cold-blast iron was superior to that of hot-blast iron. A contrasting instance might be quoted of a 21-in. steel pipe taken out of use owing to alterations a few years ago. This pipe had been used continuously for the conveyance of filtered London water for eighteen years. The whole internal surface was covered with nodular oxidation averaging, perhaps, ½ in. high, below each nodule there being a complementary pit. There was no evidence as to the material which had been used as a protective coating. Apart altogether from the reduced strength of the pipe due to the severe pitting, the increase in the coefficient of friction would have been very serious in any considerable length of main. At a very moderate estimate that coefficient must have been at least four times that of the pipe when new. About a month before the meeting he had occasion to open for examination some 42-in. steel pipes which had been used for fourteen years for the conveyance of raw Thames water through a tunnel beneath the river Thames. The internal surface of those pipes was entirely free from oxidation and perfectly smooth. The whole surface was coated to a depth of about ½ in., with a soft deposit which he took to be clay, the water conveyed containing small proportions of that material in suspension. It was of about the consistency of cream cheese, and could be readily brushed off. Apparently this coating had afforded complete protection against oxidation. The pipes had been given one coat of Siderosthen at the steel works and another after erection, but he was disposed to attach greater importance to the protective action of the deposit than to the coating, Siderosthen applied on the outside of the pipes, exposed to the damp air of the tunnel, having been found quite useless, and having to be brushed off and a special tar varnish substituted within a few months of its application. He could not venture to give the reason for the clay deposit clinging to the steel pipes while showing no disposition to adhere to the cast-iron pipes forming a part of the same main. He might mention that Siderosthen was a tar varnish the basis of which was the tar, which formed one of the by-products of oil-gas distillation. He feared that his remarks had not been very pregnant of suggestion, but trusted that the practical experiences given might possibly be of some interest.

Dr. Eric Rideal said that he considered the electrolytic theory of corrosion constituted a marked advance on the acid theory, since, although expressing potentially the same idea as that theory, it gave a greater insight into the actual mechanism of the process, and it was only by studying this mechanism carefully that practical solutions to the corrosion difficulty would be found. He suggested the following explanation of Heyn and Bauer's experiments of which Mr. Binnie had just given a *résumé*, and which Sir William Ramsey had referred to. On the electrolytic theory of corrosion, the action taking place could be divided into two entirely distinct processes—first, the liberation of hydrogen by the discharge of hydrions; and, secondly, the removal of the liberated hydrogen by means of an oxidiser, such as dissolved oxygen in the water. It appeared likely that the experiments of Heyn and Bauer indicated that the effect of increasing the velocity of the water was primarily to increase the rate of removal of hydrogen by bringing more oxygen in contact with the surface of the metal in unit time, and possibly also by actual mechanical means. After a certain critical velocity the equilibrium between the rate of formation of hydrogen and its rate of removal was reached, and since the rate of formation depended in this case practically only on the nature of the impurities in the iron and steel under investigation, it seemed clear that a further increase in the corrosion was not to be expected after reaching this critical point. He was very pleased that the exact conditions obtaining in the now famous Western Australian Goldfields pipe line had been published, since in actual practice the problem of dissolved oxygen had become an increasingly important one, in part due to the more frequent adoption of air lifts for water supplies. He had in his hand a corroded elbow, one of many taken from a hot-water system where the lifted water saturated with air had been discharged directly into the hot-water system. Under these conditions he had found that the oxygen liberated on heating the water had acted more especially on all the elbows and bends in the pipe where the gas could come in close contact with the metal. He welcomed Mr. Binnie's remarks on the deleterious effects of sea water, which were especially evident in the presence of air, as well as

where ashes and cinders were present. He had found that the practice adopted on the Flagler Railroad system, running from Key West, Fla., to Jacksonville, a part of which was continuously exposed to a salt spray, was well protected by a mixture of tar, cement, paraffin and rosin, provided that the mixture was made up with boiling tar. In tropical countries he had found that 4 parts of magnesium chloride per 100,000 in the water soon made its deleterious effects evident; as a preventative it had been found that zinc paints were more effective than red lead. He was glad that Mr. Binnie had referred to the Catskill aqueduct system of protection by Portland cement mortar, which was a process that he himself had frequently advocated. He could testify to the excellent results obtained in the New York scheme by this method, but it had to be remembered in this connection that the steel pipes had been well treated before lining with the cement. All the mill scale had been removed both by chipping, scraping and scrubbing with wire brushes, and finally the plates of the pipes had been washed with warm sulphuric acid before the final treatment. He rather deprecated the drawing of practical conclusions from experiments conducted with pure substances, such as electrolytic iron, distilled or air-free water, since the electrolytic theory had given the key to a method of practical testing with samples of the actual materials, such as cast iron, wrought iron, or steel, various "rust preventers," or paints, and water or soil with which the pipe was going to be placed in contact. He was more particularly alluding to the method of testing by applied E.M.F., which was practically a method of stimulating the natural effects to such an extent that but a few days need elapse to show the effects of years of the natural process. The results of the method, as far as he had tested it, made him inclined to be hopeful that finally the chemist could give to the engineer figures which, although relative, were actually of significance and value. He hoped soon that standard methods of electrolytic testing could be set up so as to ensure absolute uniformity in procedure all over the world.

Mr. Martin Deacon said he had listened with very great interest to the valuable paper which had just been read by his partner, and he would like to say a word on the subject of the treatment of pipes, whether of cast iron or steel, between the time of dipping or wrapping with hessian and the actual laying in position in the trench. He thought there is little doubt, where the ground in which a pipe is to be laid is of such a nature that some further treatment is required other than the actual dipping, such as wrapping with tarred hessian, that, providing the wrapping is properly done and judiciously handled after the treatment, the desired result will be attained. He thought for many reasons that greater efficiency would be obtained if it were practicable to wrap the hessian at the side of the trench just prior to laying, but the wrapping should be applied soon after dipping, while the bitumen coating is still just plastic, and this can only be done at the founder's works. After applying the wrapping in this manner and recoating to fill every interstice in the hessian, he found that it had adhered so tightly to the pipe that it was a physical impossibility to remove the hessian without actually chipping it off. It follows, therefore, that if the hessian is properly applied it will adhere to the pipe, and this can be done by applying it in a continuous spiral strip, always keeping the strip in tension and revolving the pipe on trunnions. He found on a recent visit to one of the foundries in this country that with the coating, whether simply a bitumen or both bitumen and hessian, the treatment of the pipes after the application was such as seriously to damage the coating. The pipes were rolled along rails to the trucks, which he believed is a common practice, with the result that the coating material was cut and damaged to such an extent as to render it of little value; the same treatment on the works still further damages the pipes, and though a local application may partially remedy the defects, it is nothing more than a patched job, not nearly so effective as the main and primary treatment. He thought that engineers should pay very careful attention to these mechanical defects, which are liable to be overlooked. They are small, but important, points which are frequently not dealt with in the specification. He thought that frequent visits to the foundry works during the process of production of the pipe and the application of the coating material is likely to be the means of the ultimate production of a specification which will deal with points otherwise liable to be neglected, the accumulation of which must materially affect the life of the pipe. If the sole inspection is left entirely in the hands of others, the tendency is for the inspector to become mechanical and be guided solely by the specification, such as it may be.

Mr. G. Bertram Kershaw (member of council) asked whether Mr. Binnie had met with corrosion in septic tanks in the presence of H_2S, due to the oxidation of the sulphur to free sulphuric acid by bacteria of the *desulphuricans* group. Corrosion, attributed to acid secretions of shellfish adhering to the piles, had occurred at a wharf in Hong Kong. The Bower-Barff process had been alluded to. He had some 10-in. pipes, 9 ft. long, treated by this process a few years ago, so that the capacity of the ovens must be fairly large. With regard to corrosive action being set up by contact of cinders or ashes with metal, it had been found at Boston, U.S.A., that a cast-iron pipe laid in the harbour in contact with coal had rapidly become very badly corroded, the sea water acting as an electrolyte. In a case which he was investigating, coal brought into contact with steel was again the cause of galvanic action being set up, corrosion resulting. He had heard of a case where in an estuary the fresh water lying on the salt, and coming into contact with iron, formed a voltaic pile, setting up corrosion. He would like to know, with reference to the Kalgoorlie case, what was the initial amount of oxygen in the raw water, and to what extent it was proposed to reduce it. He assumed the object of double coating the pipes was that by so doing minute pinholes in each coating would be extremely unlikely to become superimposed. Presumably, with a dose of only 3 grains of lime per gallon there would be little apprehension of decreased carrying capacity due to incrustation.

Mr. E. J. Fox (Stewart & Lloyds, Limited) said he thought engineers in general would be indebted to Mr. Binnie for having given a true account of the troubles experienced with the Coolgardie steel pipe line. Engineers without a knowledge of the actual facts had been inclined to blame these steel pipes, and it was well that Mr. Binnie, whose firm was professionally engaged in investigating the troubles, had now made it clear that the steel pipes—*per se*—were not responsible for the troubles. He believed where cast iron was used in connection with this pipe line—namely, for the reducing pieces, valves, &c.—that the corrosion was much more pronounced than it was in the case of the steel pipes. Those acquainted with the conditions were well aware that, had cast-iron pipes been used, not only would the cost of the scheme have been excessive, but almost certainly the corrosion in cast-iron pipes of the same size would have by this time so greatly increased the frictional resistance and consequent pumping costs on its 350 miles of length as to render its further operation impracticable. This view was fully confirmed by the experience in the water supply of Perth, Western Australia, which drew its water from the same source, and in which it had been found that a 12-in. cast-iron main had been reduced in capacity by about 75 per cent in five years by internal corrosion and incrustation, while a 21-in. wrought-steel pipe laid beside it had proved practically free from corrosion after eleven years' use. Mr. Rutter's long experience and use of cast-iron pipes perhaps not unnaturally prejudiced him in their favour; but the instances Mr. Rutter had cited that evening in favour of cast-iron pipes to the detriment of steel pipes could scarcely be called convincing. First, Mr. Rutter referred to a cast-iron pipe which had been in use for over 100 years, and had recently been found in first-class condition. Probably nobody knew better than Mr. Rutter himself that the cast iron of 100 years ago was not the cast iron of to-day, and therefore any comparison between cast-iron and steel pipes should be made between the commercial articles of to-day. Secondly, Mr. Rutter criticised a steel pipe which he had examined, and in which he had found internal incrustation to the depth of about ⅛ in. It was so generally accepted that cast-iron pipes encourage internal nodular growth to a far greater extent than did steel pipes, that the instance cited by Mr. Rutter could only leave the impression that if the pipe to which he referred had been cast iron instead of steel the internal nodular incrustation would have been far greater. Both cast-iron and steel pipes were subject to corrosion if corrosive influences were present, but it was interesting to note that, while in the case of cast iron the internal nodular incrustation often grew to a depth of 2 in to 3 in., in the case of steel it was limited to about

1 in., and while the depth to which corrosion would penetrate in the case of cast iron was about 2 in., this depth was limited, in the case of steel, to about ½ in. In conclusion, the relatively greater proportion of steel pipes used increased yearly, and as long as eight years ago the British Board of Census of Production for 1907 (published in 1909) gave the length of steel pipes bought annually as more than three times the length of cast-iron pipes.

Dr. J. Newton Friend wrote: In his paper Mr. Binnie has given a very interesting summary of the more important factors concerned in the corrosion and preservation of iron and steel. The treatment is, of necessity, brief, and therefore lends itself to almost unlimited discussion. One of the most important sections is that dealing with the relative corrodibilities of cast iron, wrought iron and steel, and, unfortunately, it is one upon which available information is scanty. The work of Thwaite, to which Mr. Binnie refers, was published about the year 1880, and is now of historical interest only. Since that date the methods of manufacturing both cast iron and steel have been completely revolutionised, and conclusions as to the relative corrodibilities of the metals manufactured thirty-five years ago are not logically applicable to those on the market to-day. The same applies, to a large proportion of the work published on the relative corrodibilities of wrought iron and steel, and further research on these interesting problems is urgently needed. At the same time it is impossible for any sweeping assertions as to the superiority of one class of iron over another from the point of view of corrodibility to be true. Recent research has conclusively proved that there are optimum conditions for each type of metal. Within the last two years Mr. C. W. Marshall and the writer have carried out a considerable number of experiments with a typical grey cast iron and a mild open-hearth steel. The results show that the cast iron was far more resistant to alternate wet and dry (*i.e.*, normal weather) conditions than steel. When completely immersed in water or salt solution there was little to choose between the metals, but when exposed to acid-corroding media the cast iron exhibited a very marked inferiority. If as the writer believes, the metals experimented with were truly representative, these results may be taken to apply to ordinary commercial grey cast iron and mild steel generally. It is interesting to note that published work indicates a similar oscillation in the relative corrodibilities of wrought iron and steel under the influence of varying corroding media. The present-day problem therefore resolves itself into the task, not of making sweeping generalisations, but rather of determining which metal is most suitable for any particular purpose. There is every reason why this should be accomplished by extensive experimental research and careful observation, but there is no other method by which the necessary information can be obtained. Furthermore—and this is a point frequently lost sight of—the problem must be attacked afresh whenever radical changes are made in the methods of producing the metals concerned.

Mr. Otto Hehner desired to join in the expression of appreciation of Mr. Binnie's papers. He had had a number of occasions, since he had the honour of collaborating with the late Mr. Deacon and Sir William Ramsay in investigating the causes of the corrosion of the Kalgoorlie main, to test the various theories referred to by Mr. Binnie, and all his further experience had convinced him that the electrolytic theory afforded a satisfactory solution. The character of the supplies which had a tendency of attacking iron was so various that it was not always easy to see the explanation. The electrolytic theory attributes the solvent power to the preponderance of hydrogen ions. Consequently water containing much calcium carbonate should not attack, yet it sometimes does attack. He had found that in at least one such case the development of beggiatoa organisms, which settled upon the pipes, was the cause. Most vegetable organisms developed acids, and these, in contact with iron, implied a local preponderance of hydrogen ions. Mustard and cress allowed to sprout on a polished marble slab etched the surface by dissolving the calcium carbonate. Most waters, however, which attacked iron contained but little carbonate. This was notably the case with the Derwent Valley water supply, which at the present time gave trouble in Nottingham and other Midland towns. This water, especially when hot, dissolved iron rapidly; but he had found that when its temporary hardness (which was only 0·4) was brought up to as little as 2 deg., it lost its solving power. This hardening—that is to say, the introduction of hydroxyl ions—could be readily effected in some cases by mixing a small proportion of the pre-Derwent supply. In connection with the same supply he had found that when hot it powerfully attacked galvanised pipes, a continual evolution of hydrogen being observable. A most minute trace of zinc hydroxide went into solution. As a consequence, Derwent water, which had first passed through a galvanised pipe, no longer attacked iron pipes. He was, however, of opinion that galvanised pipes in household use were undesirable, and afforded only an apparent protection from attack, the dissolved zinc being colourless—not being, therefore, apparent to the user, who would notice a very minute trace of iron rust. He had found considerable deposits of basic zinc carbonate in kitchen boilers and domestic hot-water pipes. A very interesting instance of attack had come under his notice a few years back in the case of a Kentish town supplied with water from the Tunbridge sands. This water had a temporary hardness of 8, and contained, when raised from the borehole, so considerable a quantity of ferrous carbonate that it had to be de-ironed before it could be supplied. For years the removal of the dissolved iron was effected by aërating the water by percolation through porous material. It then entered into the pipe system, and caused no trouble. Soon after the installation of an apparently improved de-ironing plant, consisting of closed vessels in which air was pumped through the water under pressure, and the precipitate of ferric hydroxide removed by filtration, also in closed vessels, the water delivered in the district became highly charged with iron, although on leaving the waterworks it was perfectly free from iron. On taking samples from the cast-iron mains, even at a distance of 4 or 5 miles from the works, no trace of iron could be found, but in the houses the water, both from the taps and particularly from the kitchen boilers, was laden with dissolved and suspended iron compounds. The pipes connecting the cast-iron main with the houses—which often stood a considerable distance away from the road—were of wrought iron; this was powerfully attacked. Now for the explanation: The water as raised from the well contained no less than 12·5 parts per 100,000 of carbon-dioxide—that is to say, had a preponderance of acidity, or hydrogen ions. In the original de-ironing treatment in the open air the carbon-dioxide almost wholly escaped into the air, the de-ironed water not having more than 1·1 part. The treatment in closed vessels did not in any way diminish the free carbonic acid, so that water with upwards of 12 parts of CO_2 and only 8 deg. of temporary hardness went into the main, and, of course, dissolved iron. This solution only takes place in presence of oxygen. Thus, when water saturated the carbon-dioxide, but free from oxygen, is allowed to filter through scrap iron no notable amount of iron passes into solution; but if at the same time air is blown through the scrap, water highly charged with ferrous carbonate issues. In water from which the dissolved gases have been pumped out a bright piece of steel can be kept indefinitely without showing the least tarnish. There are therefore two effective means of combating iron-solvent power—namely, the increase of hydroxyl ions, by the addition of basic materials like lime, calcium carbonate, or even hydroxyl of zinc, so that they preponderate over the hydrogen ions, or the removal of the oxygen, be it by pumping or by other means.

Mr. Binnie, in reply, expressed his thanks, particularly to those gentlemen who had taken part in the discussion. He felt that this discussion would greatly add to the value of the paper, seeing that those who contributed to it were such eminent authorities on the subject. He was very grateful to all those who took the trouble to attend, and especially Sir William Ramsay, whom they were all delighted to welcome there that evening. Now that he had become an honorary Fellow of the institute, the author felt sure that he was expressing the feelings of the other members in hoping that they would soon see him again. With regard to the remarks made by Sir William Ramsay, he was very much interested to hear his suggestion for depositing silicon in the interior of steel pipes, and he should like to see that tried. A process had been invented for protecting the surface of steel by means of granulated glass, and it was claimed that this gave practical immunity. The author had hitherto had no experience of this process, but was making certain investigations in connection with it. The author was glad to have his own personal experience with regard to the small amount of corrosion which took place

[illegible] Mr. Rutter's remarks were [illegible] blast iron resisted corrosion better than cast iron as made to-day. The difference in behaviour of the cast-iron and steel portions of the 42-in. main to which Mr. Rutter referred was difficult to explain. The steel pipes were coated internally with Siderosthen, which appeared to answer well for the inside of the pipe, but not for the outside, and he gathered that the cast-iron pipes were dipped in the ordinary way. The Birkenhead pipes were to receive a final internal coating of Siderosthen, and it was to be hoped that this would prove as effective as it was when applied to the 42-in. main referred to by Mr. Rutter. His firm had been led to adopt Siderosthen on account of the way in which it had protected iron railings exposed to moorland air for many years. The author was very much impressed with the explanation put forward by Dr. Eric Rideal to account for the difference [illegible] steel or cast iron was exposed to the action of still or moving water. It was difficult to account for the difference of behaviour of the two metals, but he was inclined to think that the general explanation put forward by Dr. Eric Rideal was correct. The importance of removing mill scale could not be over-estimated, and the author's firm were at present having an experiment carried out with a sand blast designed to effect this object. It was very desirable to have a reliable accelerated corrosion test, and to bring this about electrically was preferable to the use of dilute acids, as it was known that entirely different results were obtained when dilute sulphuric acid was used to accelerate corrosion than were found to take place under natural conditions. The author had read Dr. Eric Rideal's interesting paper contributed to the Society of Engineers, and hoped that he would pursue this branch of the subject to the advantage of the engineering profession. In reply to the points raised by Mr. Kershaw, the author had noted that, whereas iron placed at the bottom of a septic tank did not corrode rapidly, the reverse was true when the iron was at or near the surface in at least one case which had come under his notice. The amount of dissolved oxygen present in the Kalgoorlie water with which the experiments were carried out was normal —viz., about 6·5 c.c. per litre. This was reduced instantaneously to about 1·4 c.c. per litre when sprayed in the vacuum chamber. The vacuum amounted to ¾ in. of mercury, and, whereas a steel plate immersed in the ordinary Kalgoorlie water lost in weight 2·38 milligrammes per square centimetre in seven days, the loss over the same period when the plate was immersed in the water freed of its dissolved oxygen to the above extent only amounted to 0·15 milligrammes per square centimetre, the activity of corrosion being reduced to about one-sixteenth. Practically the same result was arrived at by adding 3 grains of caustic soda per gallon. Mr. Kershaw was correct in the explanation which he gave of the reason which led to the recommendation that the pipes should be dipped twice. The author was glad that Mr. Kershaw had raised the point with regard to the possibility of the lime reducing the carrying capacity of the pipe when added in excess quantities to the water, as this had taken place close to the point where the lime was added. The author believed, however, that the quantity of lime added to the water had been increased from 3 to 6 grains per gallon, but he was unable to state whether the deposit was the result of the increased dose. Mr. Bertram Blount raised the point that the dissolved oxygen could only be removed chemically, and this was no doubt true. When the water had been treated with ferrous sulphate and alkali, or when it had been charged with ferrous carbonate by filtering it after it had been carbonated through vessels containing metallic iron, the dissolved oxygen disappeared; but the cost of the process worked out at £7 13s. 4d. per 1,000,000 gallons, and was prohibitive. The milk of lime treatment reduced the attacks to one-sixteenth, and only cost 12s. 8d. per 1,000,000 gallons treated. The de-aëration effected the same amount of reduction and was recommended in conjunction with the lime treatment, and was estimated to cost slightly less than this treatment under the special conditions obtaining at the Mundaring reservoir, where the vacuum pumps could have been worked by the fall of the water from the reservoir to the pump-house. With regard to the statement made by Mr. Fox, that if cast iron had been used for the Coolgardie mains tuberculation would have been more pronounced, the author could not say whether this would have been so or not, but it would have been possible to scrape the main and keep it fairly clear of tuberculation if it had been cast iron; whereas it was impossible to scrape the steel main owing to the fact that if a fresh surface had been exposed for attack its strength would have become insufficient. With regard to the relative amount of tuberculation in steel and cast-iron mains, the author could not agree that tuberculation nodules never protruded to a greater extent than 1 in. in the inside of steel pipes, as in the case of the Coolgardie main they had been carefully measured and were found to exceed 1 in. over long lengths of main. The author was much indebted to Dr. J. Newton Friend, who had made this subject his own, for the interesting contribution which he was good enough to make in writing. The information given by Mr. Otto Hehner, with regard to the corrosive activity of the Derwent Valley water, and that derived from the Tunbridge sands, and the steps which were taken to overcome the difficulty was of great value. It was known that the water to be supplied to Birkenhead would be of very much the same character as the Derwent water, and arrangements were contemplated for the addition of lime after filtration in order to prevent, as far as possible, corrosive attacks on pipes.

GOVERNMENT HOUSING SCHEMES.

THE LONDON COUNTY COUNCIL'S POWERS.

[illegible] County Council report that they have had before them a proposal submitted by one of the principal architects to H.M. Commissioners of Works for laying out an estate in Woolwich and for the erection of a large number of houses for the accommodation of workmen employed at Woolwich Arsenal. The work is being executed under the powers conferred upon the Commissioners by the Housing Act, 1914. "We have," the committee state, "made several suggestions for alterations in the scheme, and we understand that the suggestions will be adopted. We are, however, informed that the commissioners hold the opinion that the London Building Acts do not apply to schemes carried out by the commissioners in London under the Housing Act, 1914. In view of the special circumstances which made the execution of the scheme a matter of extreme urgency, we have refrained from raising the question of the extent to which the London Building Acts apply to this particular scheme, but we have caused a letter to be sent to the commissioners informing them that the council cannot accept the view that the Building Acts do not apply to such schemes, and that the action taken in this particular instance must not be construed as in any way prejudicing the council with regard to the point should it hereafter be thought fit to raise it in relation to any similar scheme which may be put forward in future."

Asphalt and its Application in Sanitary Work.—Mr. H. Percy Boulnois, M.Inst.C.E., past president, will take the chair next Wednesday at a meeting of the Institute of Sanitary Engineers, at which Mr. Nandy Hoskins, chairman of council, will open a discussion on this subject. The meeting, which is to be held at Caxton Hall, Westminster, will commence at 8 p.m.

Government and Road Board Grants.—The County Councils Association on Wednesday adopted a resolution protesting against the requirement of the Treasury—to which reference is made in a "Minute" in this issue—that the Road Board should make it a condition of a grant towards the improvement of certain roads that they should be satisfied as to the adequate maintenance of other roads towards which they have made no grant. The resolution also expressed the opinion that the Road Board grant for 1915-16 towards the scheme previously sanctioned for the use of improved materials upon the more important main roads ought not to be largely reduced in order to relieve the Parliamentary votes for war purposes, at the cost of the Roads Improvement Fund, from the charge of remaking roads destroyed by military traffic.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

474. Roof Truss. When one end of a steel roof truss is supported on roller bearings, what provision is made to counteract the movement and to prevent damage to the slates and timbers? How would any movement in the truss affect the roof covering? How much is a 50-ft. span roof likely to move? ("T-Square.")

475. Hydraulics. A pipe 5 in. in diameter delivers a certain quantity of water per minute with a loss of head of 4 ft. Determine the loss of head if the same quantity were delivered through a pipe 4 in. in diameter, assuming the same coefficient of friction.

476. Vectors.—State the essential properties of vector quantities, and distinguish between "vectors" and "scalars," giving two examples of each.

477. Levelling.—In a series of levels, if the first back sight read 3·25 on an ordnance bench mark of 28·30, the sum of the back sights be 12·95, and fore sights 17·20, what will be the ordnance reading of the last fore sight? (E. W. P., *Southampton.*)

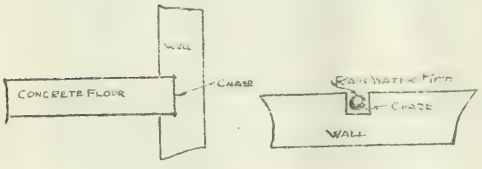
478. Levelling.—It is required to find the difference of level of two pegs on opposite banks of a river, and it is known that the collimation line of the level you have to use is out of adjustment. How would you find the difference of level required? (E. W. P., *Southampton.*)

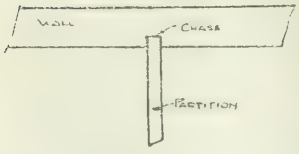
[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

471. Building Construction.—What is a "chase"? Explain its function, and give sketches in illustration. (M. T. R., *Rhyl.*)

A chase is a vertical or horizontal recess, cut or groove-formed in a wall to receive pipes, &c. For small pipes, where the exact position is not known





when the wall is built, it will be found advisable to cut the chases at the time of fixing the pipes. Chases for partitions, floors, &c., whose position is known, are better if formed as the work proceeds. Chases may be formed for taking hot-water pipes in buildings, thus saving floor space. The illustrations show some of the uses that may be made of chases. (T. S. page.)

473. Retaining Wall.—Explain carefully the different ways in which a concrete retaining wall may fail, and state how such failures can be avoided. (M. T. R., *Rhyl.*)

The ways in which a concrete retaining wall may fail are as follows: (1) By overturning. The wall will overturn if the resultant line of thrust falls outside the base line, as in Fig. 1. The resultant thrust is obtained by combining the force due to the weight of the wall with the force due to the pressure of the material which the wall supports. We shall see below that failure from this cause is improbable. (2) If the intensity of stress induced by the resultant thrust on the earth supporting the foundations of the wall exceeds the safe bearing strength of the earth at the site in question, the wall will overturn. (3) The intensity of compressive stress in the concrete due to the resultant thrust should not exceed 20 tons per square foot, or the concrete may fail by crushing. (4) If the resultant line of thrust falls outside the middle third of the section, as in Fig. 4, tension in the concrete results. This is permissible, though not advisable, up to about 30 lb. per square inch, and the position of the line of thrust, as shown in Fig. 2, is the more satisfactory. It is evidently more probable that the wall will fail by tension in the concrete than by overturning, since the former can occur before the line of thrust passes outside the section, which is a necessary condition for overturning to ensue. (5) The wall may fail by sliding upon its base. Sliding will occur if the resultant line of thrust makes with the normal to the base line an angle greater than the friction angle, as in Fig. 3. We can now consider the methods by which the above-mentioned ways of failure may be avoided: (1) Overturning due to resultant line of thrust passing outside base. Should the method given below for avoiding tension and excessive compression in concrete be used, the wall cannot fail from cause (1). (2) Overturning due to insufficient bearing strength of the earth underneath foundations can be avoided by making the latter of sufficient area. (3) and (4) Consider 1 ft.-run of wall.

The intensities of stress due to weight of wall are—

$$\frac{W}{A} \pm \frac{W.a}{Z}$$

where W = weight of 1 ft. run of wall

A = area of 1 ft. run of base

a = distance between centre of base-line and point where line of action of W intersects base-line

Z = modulus of horizontal section and for 1 ft. run of wall

$$Z = \frac{I}{y} = \frac{\frac{b \times H^3}{12}}{\frac{H}{2}} = \frac{bH^2}{6} = \frac{H^2}{6} \text{ (since } b = 1\text{)}$$

The intensities of stress due to earth or water pressure are found by considering the wall as a cantilever fixed at its base. Therefore we have—

$$W.L. \times \frac{1}{y} \text{ of } Z = \frac{bH^3}{6} = \frac{H^3}{6} \text{ (since } b = 1\text{)}$$

where W = force tending to overturn wall

L = distance from point of application of W to base = H, if the material is earth or water

f = intensity of stress at base due to overturning force

$Z = \frac{H^2}{6}$ = modulus of section

In the case of water

Force tending to overturn wall = $\frac{1}{2}$ W H²

where W = weight of unit volume of water

and H = weight of wall

In the case of earth, assuming that there is no surcharge, Rankine's formula is

$$P = \frac{1}{2} W H \left(\frac{1 - \sin a}{1 + \sin a} \right)$$

where W = weight of unit volume of earth,
H = height of wall,
a = angle of repose of earth.

The above formula is seldom, in practice, used, as it is assumed that the resultant pressure is not exerted, but also

It is obvious that the statement made is incorrect. For, let the intensity of stress at one side of base be zero.

Then $\frac{W}{A} = \frac{W}{Z}$

$$\frac{I}{A} = \frac{\frac{bd^3}{12}}{\frac{b}{d}} = \frac{d}{6}$$

... the resultant line of thrust is within the middle third. If, therefore, this limit be passed, the concrete is stressed in tension. Take a similar example (see Fig. 1). A concrete wall 24 ft. ... ft. wide at the base and 6 ft. wide at the top, retains earth to its full height. Test the wall for stability, assuming that the concrete weighs 120 lb. per cubic foot, the earth 112 lb. per cubic foot, that the angle of repose is 30 deg., and that there is no surcharge.

... the intensities of stress due to weight of wall, we have—

Weight of 1 ft. run $= \frac{24}{2} (6 + 8) 120 = 20160$ lb.

We find from the figure that $x = 8$ in.

$$P = \frac{W}{A} \pm \frac{W x}{Z}$$

$$= \frac{20160}{8} \pm \frac{20160 \times \frac{2}{3}}{\frac{8 \times 8}{6}}$$

$$= 2520 \pm 1260$$

= 3780 lb. per sq. ft. compression at B,
and 1260 ,, ,, ,, ,, A.

... the intensities of stress due to weight of earth we have—

Weight of earth pressure upon 1 ft. run ... $\times 112 = 24$...

$$\left(\frac{1 - \sin}{1 + \sin} \right) = 10752 \text{ lb.}$$

$$\text{W.L.} = \frac{bd^2}{6}$$

$$10752 \times 8 = \frac{8 \times 8}{6}$$

$$= \frac{6 \times 8 \times 10752}{8 \times 8}$$ ... sought per sq. ft. ... at A and ... at B

The nett intensities therefore are—

(a) At A 1260 + 864 = 9924 lb. per sq. ft. compression.
(b) At B 3780 − 864 = 1284 ,, ,, ,, ,,
= 24 ,, ,, ,, ,,

The latter is within the safe limits of tension for concrete, but many engineers would prefer to thicken the wall, and thus bring the resultant line of thrust within the middle third. In designing retaining walls for water the following graphic method is useful: The width of wall at base may be made ... resultant ... height, and ... side

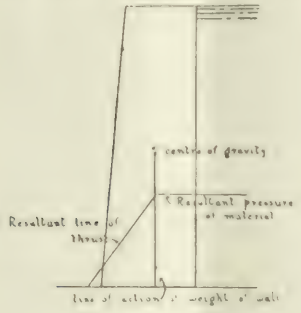


Fig. 1.

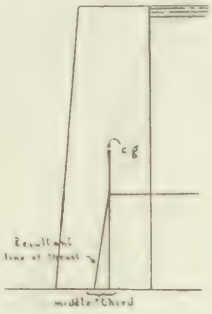


Fig. 2.

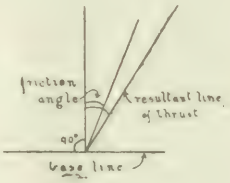


Fig. 3.

Fig. 4.

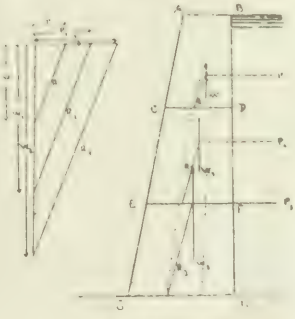


Fig. 5.

Fig. 6.

... battered to 1 in 12, the wall being then tested for ... as follows. Divide the wall into sections as shown in Fig. 5, and find the positions of the ... of gravity of the figures ABCD, ABEE and ABGH. Next find the weights of these sections, and mark them off on a scale line, as in figure. Find the water pressure on BD, BF and BH, and mark off in a similar manner; then from these we can find the resultants R_1, R_2 and R_3 of the forces W and F, W and P, W and P respectively. Draw on the section the lines of action of the above forces, adding the resultants, as shown in figure. The dotted lines indicate the outlines of the middle third of the section, and should the resultants fall within these lines the design may be considered as satisfactory. An interesting case is that of a wall triangular in section. Suppose the dam to be empty. The resultant line of thrust then passes through the extremity of the middle third of the section. If now the sloping side of the wall should happen to be subject to wind pressure, the intensity of stress at the windward side of the base changes from zero to tension, and provision should be made for this

in the design. (6) Should it be suspected that, owing to the character of the soil under the wall, or from any other cause, sliding is likely to ensue, it is best to arrange the base as shown in Fig. 6, thus ensuring that the resultant line of thrust does not make with the normal to AB an angle greater than the friction angle of the surfaces in contact.

To sum up, the stability of a concrete retaining wall depends upon the nature of the subsoil, the design of the base, and the position of the resultant line of thrust. (B. K., *Newport, Mon.*)

CORRESPONDENCE.

Ἓκ ἁπάντων οὐ πάντ' ὀρᾶ

One man does not see everything.)

EURIPIDES.

DESIGN OF THE MADRAS CITY WATERWORKS.

To the Editor of THE SURVEYOR.

SIR,—In the issue of your journal dated January 22, 1915, there appeared a description of the new works connected with the Madras city water supply. The claim made therein that Mr. J. W. Madeley, special engineer to the Corporation of Madras, was responsible for the entire design and construction of the works is absolutely unwarranted. The entire scheme for the improvement of the water supply of Madras, including its distribution in the city, was prepared by me, and the vitally important portion of the scheme—namely, that relating to the conveyance of the supply from its source to the city, its filtration and elevation—was prepared by me, and was accepted by the corporation and sanctioned by the Government of Madras some time before Mr. Madeley set his foot on Indian soil.

My scheme was the first complete scheme ever prepared for the improvement of the Madras waterworks. The scheme possessed a wealth of detail never attempted in any of its forerunners, of which there were not a few. In forwarding the scheme to Government, Mr. W. Hutton, ASSOC.M.INST.C.E., sanitary engineer to Government, remarked: "I think Mr. Nowroji is to be congratulated on the careful manner in which the work has been done, and the exhaustive character of the report describing the work. The scheme has been drawn out on sound principles, which, if carried out in Madras, will give the city what is of first importance to any town—viz., a pure and wholesome supply of water—delivered into houses uncontaminated and at a sufficient pressure." The Sanitary Commissioner said that the scheme had his entire approval, and the Sanitary Board, of which the chief engineer, Public Works Department, is the president, and the Surgeon-General a member, "unhesitatingly recommended its adoption and execution." The chief engineer who scrutinised the engineering details of the scheme stated that there was nothing to urge against the principles of the scheme, which were sound. He, however, made a few alterations in engineering details, such as strengthening the section of the conduit where it was subjected to extra earth and water pressure. He also recommended that the elevated iron tank should be larger. These alterations raised my estimate of Rs.22.5 lakhs to Rs.23.6 lakhs. Thus, slightly modified, it was finally accepted by the corporation and sanctioned by Government for execution. The Government were also graciously pleased to offer my services to the corporation to carry out the scheme I had designed, a proposal which was cordially welcomed by the commissioners. Unfortunately, at this juncture certain grave questions as regards the design and execution of the drainage works, on which some 30 lakhs had already been spent, arose. It was alleged that many lakhs spent on these works were money wasted. The commissioners, however, did not acquiesce in what they described as a sweeping condemnation of the works, and asserted that things were not as bad as they had been represented. They, however, admitted that the matter was sufficiently serious to call for a halt in the execution of the works and to subject them to a careful scrutiny, with the view of rectifying defects and avoiding them in the future. In this dilemma Government proposed, and the corporation, after demurring to it more than once, agreed to obtain an expert in municipal engineering from England on a salary equivalent to that of the chief engineer of a province. It was quite in the fitness of things that, having decided to obtain an engineer presumably of high attainments, commensurate with his salary, primarily for the drainage works, he should also be given the control of the execution of the waterworks. The corporation, however, consistently held to the opinion that it would be advantageous to employ me on the execution of the waterworks since I had designed it. So, when the special engineer arrived, the corporation passed a resolution requesting Government to place my services at their disposal for the execution of the waterworks under the supervision of the special engineer.

In the meantime I was deputed again to prepare the second part of the improvement scheme—i.e., the extension and enlargement of the distribution system. My estimate for improving the distribution system amounted to Rs.14.5 lakhs, in addition to the 23.6 lakhs for the main part of the scheme, referred to above. It thus happens that the entire project, as now completed, or rather approaching completion, was originally designed by me.

The question may rightly be asked, how far was my original scheme adhered to in its accomplishment. As the executive officer in charge of the works I constructed the first part of the scheme, including the roughing filter, 7 miles of conduit, and filters covering an area of 7 acres, three large covered reservoirs for storing filtered water, the suction well, and foundations to engine-house up to basement level. These works form the most important portion of the scheme and most difficult of execution, being all underground, some 22 ft. below the surface in heavily water-logged soil. With the exception of the last-mentioned item of work they were all constructed and are identically as designed by me. I have also designed and supervised the construction of some smaller waterworks in this Presidency, and I say without fear of contradiction that the works referred to above were carried out with less deviations from the original design than is usually the case with works of such magnitude and intricate details. I may also claim that of these alterations, which all relate to details of construction, a very substantial number emanated from me. Alterations are inevitable in the construction of all works, large or small, more in the larger works than in the smaller ones. Such alterations become necessary owing to the revealment of unforeseen circumstances and conditions, as also to the fact that during construction the engineer has more time to consider details than during the preparation of the scheme.

Of the component parts of the main scheme the engine-house and the elevated tank were redesigned by Mr. Madeley. The necessity for redesigning the engine-house was fully anticipated by me. In paragraph 122 of my report I said: "The plan of the engine-house is merely suggestive of the architectural character of the building. Its second purpose was to approximate the cost of the engine-house as near as possible. It would be redesigned to the dimensions considered necessary by the successful tenderer for the pumping plant." When I designed the scheme the rival claims of oil, steam and electric power for driving the pumping engines were vigorously urged by those partial to or interested in the supply of electric power or the manufacture of oil and steam engines. Engineers who have designed and executed waterworks know that the design of an engine-house depends upon the pumping plant finally adopted. It depends not only on the motive power, but also on the type and make of the pumps. It is, however, a significant fact that the pumping plant actually installed is of the very type recommended by me after fully discussing the economic merits of various classes and types of pumping plants; for, after all, the crucial test of a pumping plant is the working cost of a given amount of work. I provided triple-expansion surface-condensing engines, with Babcock & Wilcox boilers, superheaters, and Green's economisers. The other work redesigned by Mr. Madeley was the elevated iron tank. I have already stated the reason for redesigning. The chief engineer had recommended a tank lower than the one designed by me. In the redesign all the main principles and features of my design were incorporated. These were a foundation consisting of a monolithic mass of concrete covering the whole area occupied by the tank, and not merely under the supporting walls and pillars, a peculiarity of design now adopted wherever a heavy foundation is necessary, as in tall buildings of the sky-scraper type; a masonry plinth or tower to support the iron tank; a ferro-concrete floor; and a limit of 25 ft. for the maximum depth of the iron tank. All these cardinal principles and features of my design have been reproduced by Mr. Madeley in his redesign.

As regards the distribution system, though there is

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considerable difference in the alignment of the new pipes and in other matters, in their general principles the original scheme and Mr. Madeley's revised scheme are very similar. In its broad outline my scheme provided for a population of 600,000, with an allowance of 25 gallons per head per day. The minimum size of pipes main was fixed at 6 in. The pipe system was strengthened by providing new pipe lines to Tondiarpet and Mylapore, the extreme northern and southern districts of Madras, where the supply at present is scanty and defective. All dead ends were abolished, and pipe routes were so arranged as to prevent any interruption of supply in the event of a burst in any main. Scour valves and air valves were included. The taps provided were of Tylor's self-closing type, which I claim to have introduced, if not in India, certainly in the Madras Presidency after one of my visits to England, when one of the proprietors of the firm demonstrated to me at his works the utility of the tap. The sizes of pipes were calculated by Kutter's formula, with a coefficient of 0·013 for a maximum delivery of the day's supply in twelve hours. Without exception, all the principles enumerated above, and all the main features of my scheme were adopted and reproduced in Mr. Madeley's revised distribution scheme. Where Mr. Madeley diverged from my scheme was in the alignment of the lines for augmenting the supply to Tondiarpet and Mylapore, and in the provision of a little extra pressure and more numerous branch lines than I had.

Thus the portion of the work which is most important from an engineering point of view, and in the construction of which more difficulties were encountered than in the rest of it, has been executed identically as designed by me, and the rest of the work—namely, the engine-house, elevated iron tank, and the distribution system—were redesigned by Mr. Madeley, embodying all the essential principles and features of my original scheme. There is therefore no justification whatever for the statement that Mr. Madeley was wholly responsible for the design of the works.

Two years ago, when Government ordered my reversion to my permanent post, the commissioners of the corporation held a special meeting to request Government to permit the retention of my services in the corporation until the completion of the waterworks. The Hon. Dr. T. M. Nair, who moved the resolution to that effect, recounted my *rôle* in the design and execution of the works. In the course of a long and convincing speech, marked by consummate ability, he [illegible] Chetpet Service Reservoir and Pumping Station, and the Kilpauk Service Reservoir and Pumping Station, and the Kilpauk Service Reservoir and Pumping Station, and the Kilpauk

Institution of Municipal and County Engineers.

COUNCIL MEETING.

A meeting of the council of the Institution of Municipal and County Engineers was held at 92 Victoria-street, Westminster, S.W., on April 17th, those present being Messrs. J. S. Pickering (president, in the chair), J. Patten Barber, W. Nisbet Blain, H. P. Boulnois, J. A. Brodie, J. S. Brodie, Chas. Brownridge, G. F. Carter, J. W. Cockrill, A. E. Collins, E. J. Elford, Frank Harris, T. W. A. Hayward, W. T. Lancashire, E. B. Martin, Frank Massie, P. H. Palmer, Norman Scorgie, Allan Stevenson, R. J. Thomas, H. T. Wakelam, C. F. Wike, O. E. Winter, the consultant secretary, and the secretary. Apologies for absence were received from Messrs. A. D. Greatorex, E. P. Hooley, L. S. McKenzie, G. A. Phillips, and H. E. Stilgoe.

THE MEMBERSHIP ROLL.

The following candidates were elected:—

Members: Messrs. P. A. Benn, city surveyor, Lichfield; G. R. Collinson, deputy borough engineer, Swansea; D. M. Davies, engineer to the Neath Rural District Council; J. B. Fallowfield, surveyor to the Church Urban District Council; A. Pike, town engineer and surveyor, Volksrust Municipality; H. Taylor, deputy borough engineer, Barnsley; H. Taylor, deputy borough engineer and surveyor, Luton; and R. A. Webb, senior assistant engineer, Lagos Municipal Board, Nigeria.

Associate Members: Messrs. R. A. Gandy, assistant to borough engineer, Bedford; and M. Sabry, engineering assistant to Leeds sewerage department.

Students: Messrs. E. H. Elgar, engineer's office, Walthamstow Urban District Council; E. A. Lister, borough engineer's office, Bridlington; and W. Muir-Smith, borough engineer's office, Eastbourne.

Transfer from Associate Member to Member: Mr. G. E. Jarman, municipal engineer, Amritsar, India.

LETTERS OF CONDOLENCE.

It was resolved to express the sympathy of the council with the families of the late Prof. Henry Robinson and Mr. W. Dyack in their bereavement.

CITY OF LONDON NATIONAL GUARD VOLUNTEER CORPS.

It was resolved to nominate Captain W. H. Prescott as the representative from this institution on the committee of the above-mentioned corps.

PROTECTION OF ANCIENT BUILDINGS.

A letter was received from the Society for the Protection of Ancient Buildings as follows:—

"I am desired by my committee to approach your institution on the subject of the repair and extension of ancient buildings in the care of the municipal and county surveyors.

"Cases have lately occurred when the society has learned too late that works of repair have been undertaken with results that the lovers of ancient buildings deplore, and this, not through lack of appreciation of their value on the part of the city and county councils, but because, not having had a large experience in this special branch of their work, the surveyors had not known where to get the appropriate materials for the work nor the best means of employing these.

"My society wishes me to place its services, as a consulting body, at the disposal of all surveyors who have at any time to consider these proposals, and it does this hoping that this offer will be appreciated as an example of this society's wish to help in the difficult matter.

"The society does not wish to force its views unasked or unwanted on all the local authorities, as it realises that in this matter, as in all others, freedom of individual thought is necessary if good results are to follow. The society is, however, strongly of opinion that friendly discussion of various cases can be followed by nothing but good.

"The terms on which this offer is made are as follows:—

"The society will consider any proposals which come before it free of cost, and it will, if desired, obtain and consider a report on any building at a nominal cost to cover the expenses in connection with the work involved.

"The society approaches your influential institution with this offer believing that it will be welcomed by you, and that the exchange of ideas, either privately or at the public direction of the local authorities, will prove of use to those concerned in the upkeep of the ancient monuments of the past.

"I am further desired to inform your institution that this society would welcome the opportunity to arrange for a paper to be read before your members at one of your ordinary meetings on this interesting and important subject."

It was resolved to welcome the invitation to co-operate with the society and to arrange for a paper on Protection of Ancient Buildings to be read at the forthcoming annual general meeting.

ELECTRIC VEHICLE COMMITTEE.

A letter was received from the Electric Vehicle Committee of the Incorporated Municipal Electrical Association inviting the nomination of a representative. It was resolved to nominate Mr. A. E. Collins as a representative from this institution.

STANDARD SPECIFICATION FOR SALT-GLAZED WARE PIPES.

Draft clauses for insertion in the Standard Specification for Stoneware Pipes dealing with the thickness of stoneware on spigot ends and the sockets were submitted by Mr. E. J. Elford, and after discussion it was resolved to forward them to the Sectional Committee of the Engineering Standards Committee on Salt-glazed Ware Pipes.

PREMIUM SCHEME, 1915-16.

It was resolved that the premium scheme for the year commencing May 1, 1915, should be similar to that for 1914-15—viz., three prizes of £5 5s., £4 4s., and £3 3s. respectively, for the three best original papers read at a meeting in connection with the institution, or published in the *Journal*, the council reserving the right to withhold all or any one of the prizes in the event of no paper of sufficient merit being presented.

ELECTION OF DISTRICT OFFICERS, 1915-16.

The report of the returning officer and scrutineers as to the scrutiny of the nomination papers and ballot lists for the election of district officers for the year 1915-16 was received. The result of the election was as follows:—

Metropolitan District.—District chairman, G. W. Humphreys (London County Council); district representatives, P. Dodd (Wandsworth), O. E. Winter (Hampstead); district secretary, Norman Scorgie (Hackney).

North Wales District.—District chairman: J. P. Evans (Wrexham); district representative, W. Jones (Colwyn Bay); district secretary, J. England (Wrexham).

West Midland District.—District chairman, A. T. Davis (Shropshire); district representative, F. C. Cook (Nuneaton); district secretary, F. C. Cook (Nuneaton).

Southern District.—District chairman, R. Read (Gloucester); district representative, L. S. McKenzie (Bristol); district secretary, F. R. Phipps (Basingstoke).

Irish District.—Vice-president, J. W. Leebody (Co. Tyrone)*; district chairman, H. F. Gullan (Belfast)*; district representative, R. H. Dorman (Armagh)*; district secretary, M. Sellars (Dundalk).*

East Midland District.—District chairman, F. G. Mawbey (Leicester); district representative, W. B. Purser (Kesteven County Council); district secretary, E. H. Crump (Hinckley).

South Western District.—District chairman, James Paton (Plymouth); district representative, T. Moulding (Exeter); district secretary, D. Edwards (Taunton).

South Wales District.—District chairman, W. Harpur (Cardiff); district representative, G. A. Phillips (Glamorganshire); district secretary, H. Alex. Clarke (Briton Ferry).

North-Eastern District.—District chairman, J. P. Wakeford (Wakefield); district representatives, L. Roseveare (South Shields), W. J. Steele (Newcastle-on-Tyne); district secretary, F. O. Kirby (Doncaster).

Scottish District.—Vice-president, Allan Stevenson (Ayrshire); district chairman, J. Young (Ayr); district

representative, T. Nisbet Glasgow), district secretary, D. V. Donald (Grangemouth).

South-Eastern District. District chairman, A. Dr[illegible] and (Surrey), district representative, H. W. Bowen (West Sussex), district secretary, J. L. Redman (Gillingham).

Dublin District. District chairman, H. J. Wakelam (Middlesex), district representatives, J. A. Webb (Hendon), E. Wilks (Norwich), district secretary, H. Collins (Colchester).

North Wales District. District chairman, J. S. Brodie (Blackpool), district representatives, W. Stubbs (Blackburn), A. W. Brodie, (St. Helens), district secretary, A. W. Bradley (St. Helens).

Indian District. District chairman, L. P. Marshall (Durgaon), district secretary, A. F. Henderson (Chittagong).

African District. District chairman, W. Dickson (Johannesburg), district secretary, T. W. Smithorpe (Pretoria).

BOARD OF EXAMINERS.

It was resolved to add the name of Mr. [illegible] Wilson on the list of the Board of Examiners.

MUNICIPAL AND COUNTY CLUB.

It was resolved to accept the offer of the Municipal and County Club during the annual general meeting, and to offer the thanks of the council for the club's kindness.

BADGE FOR VICE-PRESIDENTS.

A suggestion was received from the South-Eastern District for the provision of a badge for Vice-presidents, and it was resolved to refer the matter to the General Purposes Committee for discussion and report.

CHARLES JONES MEMORIAL FUND.

It was reported that a replica of the portrait of the late Mr. Charles Jones in the Ealing Town Hall could be obtained for the amount subscribed, and it was resolved, therefore, to purchase such a replica to be hung in the council chamber of the institution.

DEPARTMENTAL COMMITTEE.

A resolution was received from the Eastern District suggesting that the attention of all the districts should be drawn to the appointment of departmental committees to deal with matters affecting municipal and county engineers, so that each district should have an opportunity of reporting to the council on the matter. The suggestion was considered very valuable, and it was resolved to carry it out. It was resolved that such discussions should not be open to the Press or be published.

PERIOD FOR BALLOT.

A letter [the full text of which was given in last week's SURVEYOR] was received from the hon. district secretary for the African District drawing attention to the impossibility of South African members returning ballot papers within the period prescribed by the by-laws. The council decided to point out that any alteration in the period would have to take into consideration the maximum time occupied in transmission to and from the most distant members all over the world, which would involve a very great extension of the time allowed for the ballot.

SPECIAL COUNCIL MEETING.

A special meeting of the council, to discuss the question of heavy traffic and to nominate witnesses to appear before the Departmental Committee, was held at 92 Victoria street, Westminster, S.W., on April 17th. Mr. J. S. Pickering, president, occupied the chair, and there were present Messrs. J. Patten Barber, W. Nisbet Blair, H. P. Boulnois, J. A. Brodie, J. S. Brodie, Chas. Brownridge, G. F. Carter, J. W. Cockrill, A. E. Collins, E. J. Elford, Frank Harris, T. W. A. Hayward, W. T. Lancashire, E. B. Martin, Frank Massie, Norman Scorgie, Allan Stevenson, R. J. Thomas, H. T. Wakelam, C. F. Wike, O. E. Winter, the consultant secretary, and the secretary.

NOMINATION OF WITNESSES.

It was resolved to nominate Messrs. W. Nisbet Blair, J. A. Brodie, A. E. Collins, J. S. Pickering, R. J. Thomas and H. T. Wakelam as witnesses to appear before the Departmental Committee with power to add to their number.

In order that no aspect of the subject should be overlooked, it was resolved to invite each hon. district secretary to ascertain the opinions of the members in his district, and to forward them to the [illegible] not later than May 22, 1915.

ROAD CONFERENCE June 24th to 26th.

In connection with the [illegible] the secretary announced that on the occasion of the forthcoming annual general meeting of the institution it has been decided to hold a road conference in conjunction with the Road Congress and Exhibition arranged by the County Councils Association, and that representatives of authorities attending the congress and exhibition are, Mr. Robinson states, cordially invited to be present at the conference. Previous conferences, he adds, have proved so successful, and the papers and discussions of such value in the elucidation of the problems of road [illegible] and administration, that, in view of the great and increasing importance of such matters, it is hoped that full advantage will be taken by authorities of this invitation.

The following is a preliminary list of the papers to be read and [illegible] at the conference:—

"The Improvement and Maintenance of Highways in connection with Modern Traffic Conditions," by C. F. Gettings, county surveyor, Worcestershire.

"Improvement and Maintenance of Highways," by J. S. Brodie, M.INST.C.E., borough engineer, Blackpool.

"Some Recent Experiences in the Surfacing and Maintenance of Roads, particularly on a Clay Subsoil," by J. A. Webb, surveyor, Hendon Rural District Council.

"[illegible] Haulage of Materials on the Highway," by F. W. Smart, chief engineering assistant, Bedfordshire.

"Mechanical Traction for Municipal Work," by E. J. Elford, borough surveyor, Southend-on-Sea.

"Haulage by Mechanical Means *v.* Horse Power," by J. Rush Dixon, M.INST.C.E., borough engineer, Wakefield.

"Haulage by Mechanical Means," by T. W. E. Higgens, ASSOC.M.INST.C.E., borough engineer, Chelsea.

"Reinforced Concrete for Roads, Sewerage, &c.," by A. E. Collins, M.INST.C.E., city engineer, Norwich.

"Fire Brigade Organisation and Equipment," by W. A. Farnham, engineer and surveyor, Foots Cray Urban District Council.

"Notes on Sewage Treatment by Forced Aëration," by J. P. Wakeford, M.INST.C.E., city surveyor, Wakefield.

"Ejectors," by I. Shone.

"Protection of Ancient Buildings."

PROVISIONAL PROGRAMME.

Thursday, June 24th.—General business of the institution.
Presidential address and presentation of premiums.
Road conference.
Annual dinner.

Friday, June 25th.—Road conference.
Opening of Road Exhibition.

Saturday, June 26th.—Visits to Engineering Works.

Cost of Horse-keep. The following summary of the cost to the Nuneaton Corporation of horse-keep per week (exclusive of horsekeeper's wages) appears in the annual report of Mr. F. C. Cook, ASSOC.M.INST.C.E., the borough engineer and surveyor of Nuneaton: Bedding, 11·42d. per horse per week; forage, 11s. 4·27d. per horse per week; [illegible], 10·35d. per horse per week; shoeing, 1s. 3·31d. per horse per week; veterinary surgeon, 4·23d. per horse per week; sundries, 5·05d. per horse per week; total, 15s. 2·65d. The sum charged by haulage contractors for horse, cart and man per day is 7s. 6d. The work done by the corporation horses is booked in the same way as if it were carried out by the hired hauliers. Putting the effective life of a horse at seven years, and allowing for stable rent, horsekeeper's wages, and all other charges, the nett saving in maintaining a stud of fourteen horses, as compared with hiring from hauliers, was £112 17s. As a matter of fact, the borough engineer points out, the saving is considerably greater, inasmuch as the corporation horses are at hand for all emergencies, and are more convenient for the work of the town in every way.

* Nominated by the council, as no nomination papers were received from the members on or before the prescribed date.

THE STABILITY OF QUAY WALLS ON EARTH FOUNDATIONS.*

By F. E. Wentworth-Sheilds, M.Inst.C.E.

In spite of the large amount of experience which has been gained in the construction of quay walls, it is still one of the most difficult problems in engineering to design a wall on an earth foundation with confidence that it will be stable when completed. A warehouse or a bridge can now be designed not only with the assurance that it will bear its load, but also with a knowledge of its factor of safety sufficiently accurate to satisfy the designer that material has not been wasted. But the same certainly cannot be said of a retaining wall on a soft bottom—at all events, not of a wall, say, 40 ft. to 80 ft. high, such as is commonly needed to sustain the quays of a modern dock. Even if the designer of such a wall is assured that it will stand, he cannot with any confidence tell one what factor of safety it possesses. The cause of his uncertainty is, of course, the difficulty of ascertaining the actual lateral pressure imposed by an earth backing, and the actual resistance offered by an earth foundation. His difficulties are thus different from those of the engineer who has to design large masonry dams. The latter structures are invariably placed on a foundation of solid rock, and the designers' chief care is that the stresses in the masonry of which the dam is composed shall not exceed a safe limit. The dock engineer, on the other hand, has to be careful that his wall shall not move as a whole on the comparatively soft material on which such structures have in general to be placed. The object of this paper is to consider the uncertainties and difficulties which the designer of a quay wall has to face, and, if possible, to ascertain how far calculations can assist him, and how far he must trust to judgment based on experience. It is also intended to urge upon the Concrete Institute the importance of collecting information upon this subject in the hopes that by degrees these difficulties and uncertainties may be cleared away.

A retaining wall may fail, as a whole, in two ways:

(1) By sliding forward on its base, and

(2) By overturning.

It may be said at once that, as regards quay walls, at least, the former mode of failure (by sliding forward) is by far the more common.

The conditions of stability in a "gravity" wall may be summarised thus:—

The forces tending to thrust the wall outwards (generally the lateral pressure of the earth backing) must be at least equalled by the forces tending to restrain it or thrust it inwards. The latter forces are generally the pressure of the water under it in front of it, the resistance of the earth in front of its toe, and the horizontal resistance to shear (or the friction) at the base of the wall. If these horizontal forces balance, the wall cannot slide forward.

The resultant of the outward forces, however, is almost always at a higher level than the resultant of the inward forces. Thus a couple is formed tending to overturn the wall about its toe. This couple induces a counter couple tending to keep it upright. The forces forming this counter couple consist, on the one hand, of the weight of the wall acting vertically downwards, together with the weight of any earth or water which may lie above the base of the wall, and, on the other hand, the upward resistance of the earth under that base.

If the upward resistance of the earth beneath the wall is capable of forming with the downward weights a couple at least equal to the overturning couple, the wall cannot overturn.

In order that the earth beneath the wall shall be capable of forming this righting couple, two things are necessary. It is obvious that the centre of the earth's resistance must be forward of the centre of gravity of the wall and of other loads on the base, and generally it is forward also of the mid-point of the base of the wall. Consequently the intensity of upward resistance is generally greatest at the toe and least at the heel. In order to preserve stability the resistance at the toe must not be greater than the maximum which the earth is capable of offering, and that at the heel must not be less than the pressure induced by the tendency of the earth to rise at this point.

Calculations for the stability of quay walls cannot in our present state be always relied upon, and failures on the one hand and waste of material on the other are liable to occur even to the most careful and experienced designer. This, however, is not saying that such calculations should be entirely ignored. On the contrary, they are most useful in suggesting means for increasing in the most economical manner the stability of designs which are known or suspected to be weak.

The author here dealt with some devices which have been used for increasing the stability of quay walls—namely: (1) Admission of water into dock, (2) sinking foundations deeper, (3) building buttress walls in front on main wall, (4) making wall wider, (5) removing a portion of the backing, (6) improving backing, (7) sloping base of wall, (8) driving piles under base, (9) anchor ties, (10) lengthening toe.

In conclusion it may be said that, owing to the difficulty and expense of making experiments on large walls, it is the more important that careful records should be kept and published of both successes and failures in this class of structure. Such records should include not only dimensions of the wall, and careful notes as to the nature of the materials employed, but also the calculations for stability, with the formulæ used, the assumptions made for the values of constants in those formulæ, and the reasons for such assumptions.

It is, of course, unlikely that it will ever be possible to design large quay walls purely from rules and without some measure of judgment, but if a body of information, as suggested above, could be collected and analysed, it would help to clear away some of the uncertainties which now beset that interesting, though troublesome, problem—the most economical design of high quay walls on earth foundations.

* Abstract of a paper read at the last meeting of the Concrete Institute.

A GOOD MATERIAL FOR PATCHING.

Owing to the restriction of loans from the Road Board this year as a result of the abnormal conditions to which the country is subjected owing to the national crisis we are at present passing through, one assumes that much of the work done upon the roads throughout the country during the year will take the form of repairs, rather than actual construction, and there is accordingly bound to be a large amount of patching done.

Bi-Tarco, which contains a large amount of pure bitumen and other agglomerating substances, forms an ideal binder for this class of work, and very large quantities of this material are used annually in this connection.

It is interesting to know that Messrs. R. S. Clare & Co.'s materials comply in every respect with the requirements of the High Explosives Department of the War Office.

WE AGREE.

The following is from *Punch* of Wednesday:—

"Wanted, a Two-legged Horse, not less than 16 hands.—Apply, Borough Surveyor, Tamworth.—*Tamworth Herald.*

"Unless the animal is wanted for the local museum, we would suggest that one with more legs, even if fewer hands, would be preferable."

Fungus in Effluent Pipes from Sewage Farms.—Will any surveyor who has had trouble with this nuisance and successfully dealt with it kindly communicate with a fellow official who is anxious to obtain information respecting the question? Address "A. B. C.," c/o The Editor, The Surveyor, 24 Bridle lane, Fleet-street, London, E.C.

Architects' Volunteer Training Corps.—The council of the Society of Architects, in response to an appeal for financial assistance from the committee of the Architects' Volunteer Training Corps, which now forms the 4th Battalion of the Central London Regiment (Volunteers), is sending the committee a donation of 25 guineas towards the Preliminary Expenses Fund. Major E. C. P. Monson (T.D.), president of the society, has been gazetted Sub-Commandant of the corps, and will be glad to hear from any members of the society who are not eligible for H.M. Forces and have not already joined any other Volunteer corps, with a view to their joining the Architects' Corps.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Axbridge R.D.C. (April 20th. Mr. W. O. L. Meade-King). £1,000 in connection with the scheme, almost completed, of improving the East Brent to Weston-super-Mare road.—It was explained that of the originally estimated cost of £7,800 the Road Board had made a grant of £2,000 and the county council had granted £500, the arrangement being that the remainder of the expense should be borne by the Axbridge Rural and the Weston-super-Mare Urban District Councils in the proportions of four-fifths and one-fifth respectively. Evidence in support of the application was given by the county surveyor, Mr. E. J. Stead, and the surveyor to the rural council, Mr. J. K. Dunster.

Ballymena U.D.C. (April 23rd. Mr. P. C. Cowan). £7,000 for the extension of the waterworks. It was stated that the [illegible] obtained agreements from the owners of [illegible] properties with one exception. Under the old scheme the council were only entitled to a supply of water from the Quoile River of 1,440,000 gallons a week, but under the new arrangement they would be entitled to take a supply of 3,400,000 gallons. The owner [illegible] put under these agreements about £2,200 as compensation. Mr. J. E. Crousdaile, M.INST.C.E., Belfast, stated that he had prepared plans and specifications for the laying of an extra 7-in. pipe from the reservoir to the filter-beds, at a cost of £2,989, with £610 for [illegible] a total of £3,600, which, with the compensation allowances, brought the total [illegible] to £37.

Belfast R.D.C. (April 21st. Mr. P. C. Cowan).—£329 for the purpose of [illegible] and Whitehouse [illegible]. The [illegible] he need scarcely remind the council that in these war times it was the duty of local authorities to reduce capital expenditure as much as possible and to keep it to a minimum. That was for various reasons. First of all the [illegible] of interest were high; and, secondly, labour was dear. Those were reasons why works involving capital expenditure should not be gone on with except they were really urgent. Mr. Hugh Harper briefly outlined the nature of the extensions proposed. Three separate loans had been sanctioned by the Local Government Board. The first was for £6,500, the second for £3,500, and the third for £800. All the works which were required to be done, and for which those moneys were obtained, had now been completed and the money paid over. The present inquiry had to do with extensions on the Antrim-road, costing £88; the Ballyclare-road, costing £99; and the Carnmoney-road, costing £119.—There was no opposition.

Croydon T.C. (April 20th. Mr. George L. Pepler). —This was an inquiry into an application for permission to prepare a town planning scheme for an area of 800 acres in the Beulah Hill district of Croydon.—There was no opposition, except in the form of an intimation from the Ecclesiastical Commissioners that they did not wish 150 acres belonging to them to be included, as they had already decided that its development should be on town planning lines.

Malton R.D.C. (April 20th. Mr. A. W. Brightmore). £820 for a water supply scheme for Whitwell. —It was stated that several years ago Sir Edmund A. Lechmere, the lord of the manor, carried out successful boring operations, and provided water for the village at a cost of about £700. Two years ago he offered to hand the plant over to the Malton Rural District Council, and this offer was accepted. It had, however, been found necessary to make extensions, and it is for that purpose that the money it is proposed to borrow is required. The clerk (Mr. G. S. Cattle) asked that the repayments should be spread over a period of thirty years.

Portrush U.D.C. (April 26th. Mr. P. C. Cowan). £500 for the extension of the waterworks. Evidence as to the urgency of the scheme was given by councillors and officials. In the course of the inquiry it transpired that a serious waste of water was going on to the extent of 2,300 gallons per hour. The quantity used throughout the town was 5,000 gallons per hour, or 120,000 gallons per twenty-four hours for a population of 2,000. Mr. Cowan remarked that there [illegible] as would supply the whole town.

APPLICATIONS FOR LOANS.

Bedwellty U.D.C.—£3,000 for gasworks extensions.

Carlisle T.C. [illegible] of the [illegible] Blackwell road.

Holland C.C.—£345 for small holdings adaptation works, and £220 for school building improvement.

Mansfield T.C.—£300 for sewerage works.

Nottingham T.C.—£4,500 for hospital extension.

Stoke Newington B.C.—£4,000 for the electricity undertaking.

LOANS SANCTIONED.

Birmingham, Tame and Rea Drainage Board.—£47 [illegible]

Gloucestershire C.C.—£4,300 for school buildings.

Seaford U.D.C.—£568 for sewerage works.

FORTHCOMING INQUIRIES.

APRIL

1. **Biggleswade.** For the construction of a [illegible] (Mr. A. W. [illegible] 5,000
4. **Newport (Mon.).** [illegible] disposal (Mr. P. M. Crosthwaite) ... 14,820
5. **St. Albans.** For works of sewage disposal (Mr. A. W. [illegible] 4,761
6. **Farnham.** For works of sewage disposal (Mr. A. W. [illegible] 15,240

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

By permission of the town council and the borough engineer, Mr. Ernest J. Elford, M.INST.C.E., M.I.M.E., a visit will be paid to the Southend-on-Sea sewage disposal works and refuse destructor on Saturday, May 8th. Objects of interest: Grit and screening chambers; modern sedimentation tanks; roughing filters; percolating filters; pumping station and plant, including Humphrey pump; destructor works.

PROGRAMME.

2.50 p.m.—Visitors to alight at Prittlewell Station (G.E.R.) and proceed to the works (five minutes).

3.15 p.m.—Visitors will be conducted over the works by the borough engineer, who will give a description of the works.

5 p.m.—Visitors will be entertained at tea

Visitors arriving early will find the following places of great interest—viz.: Corporation promenade pier; swimming bath; esplanades; Boulevard, Thorpe Bay and Southchurch cliffs, bandstand, &c. Trains leave Liverpool-street (G.E.R.), 1.50 p.m.; Southend to Prittlewell, 1.35, 2.0, 2.15, 3.20. Trams from Southend to Prittlewell—about fifteen minutes' walk from works.

Proposed New Water Supply for Lanarkshire.—An inquiry has been opened in Edinburgh into the Provisional Order of the Middle Ward of Lanarkshire for the introduction of a new water supply. Under the order the eastern area of Dumbartonshire is sought to be included in the Lanarkshire area.

Wolverhampton Water Bill.—The hearing of the case for and against the Wolverhampton Corporation Water Bill, which occupied the attention of the Select Committee of the House of Lords all last week, reached its closing stages on Wednesday with the termination of the evidence against the proposed pumping station at Ivetsey and the delivery of speeches by counsel.

Manchester City Surveyor's Appeal.—As the result of a special appeal issued recently by the city surveyor of Manchester, Mr. T. de Courcy Meade, and a visit from Captain Walkley, twenty-nine of the city surveyor's staff have joined the Army, making, with the twenty-three already enlisted since August, a total of fifty-two out of the 154 members of the staff.

The Government and Epping Forest.—At the meeting of the City of London Corporation, Mr. Harry Bird, chairman of the Epping Forest Committee, mentioned that there were several proposals before a Governmental inquiry now in progress which very seriously interfered with Epping Forest. Several important arterial roads were under discussion, and it was only by the courtesy of the conference that the superintendent of the forest was permitted to attend

Municipal Work in Progress and Projected.

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The following are among the more important projected works, of which particulars appear below: Buildings—Tottenham; housing and town planning—Merthyr, Holmfirth; refuse disposal—Newark; roads and materials—Brighton, Dulverton; sewerage and sewage disposal—Aylesbury, Dorchester, Golcar, Pontefract; water, gas and electricity—Clutton, Kidwelly. Particulars of other projected works will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Dulverton R.D.C.—It has been decided to rebuild Broc Bridge, situated on the road leading to Southmolton, and to improve the approaches. Towards the rebuilding of the bridge the Somerset County Council are making a grant.

Fermanagh C.C.—Professor Scott, of Dublin, has been appointed architect in connection with the scheme for a new sanatorium which it is proposed to build at Enniskillen.

Holme Cultram U.D.C.—Mr. J. C. Boyd, engineer, reported recently to the council that the Silloth sea wall had been completed at last. The council decided to appoint Mr. Boyd consulting engineer in connection with the structure for one year.

Hull T.C.—The Health Committee have resolved (after hearing a verbal report from the town clerk as to an interview with the Local Government Board) to proceed with the work of building the tuberculosis hospital, with which good progress has already been made. The committee refused, after a long discussion, to allow the substitution of "first quality Swedish" timber for "St. Petersburg" timber in the contract.

Tottenham U.D.C.—Subject to the approval of the Local Government Board, it has been agreed to purchase 14½ acres at Devonshire-hill, at the rate of £550 per acre, as a site for a proposed hospital.

HOUSING AND TOWN PLANNING.

Holmfirth U.D.C.—A revised plan of the council's housing scheme has been forwarded to the Local Government Board.

Merthyr T.C.—A scheme for the erection of workmen's houses is to be prepared for Gellyfaelog.

Taunton T.C.—In consequence of the increased cost of timber through the war, a sum of £56 has been added to the tender of Mr. H. G. Smith (which originally amounted to the sum of £1,765) for the erection of twelve additional workmen's dwellings at String-lane.

Weetslade U.D.C.—The council are giving consideration to the housing conditions of the district.

PARKS AND OPEN SPACES.

Stourbridge T.C.—The proposed purchase by the council of the Studley Court estate for the purposes of a public park has been referred to the Baths and Parks Committee.

REFUSE COLLECTION AND DISPOSAL.

Chatham T.C.—The town clerk of Rochester has written stating that his corporation do not see their way to join the Corporation of Chatham in establishing a joint refuse destructor for the two towns.

Newark T.C.—The council on Monday adopted a recommendation of the Sanitary Committee to consider the provision of a dust destructor at once.

Teddington U.D.C.—It was decided last week to send up the names of sixteen men for use in the output of munitions. The chairman, Dr. Langdon-Down, said that if they went he would suggest that the collection of refuse should be made every other day instead of daily, and the same with street scavenging, and work that was done weekly might be done fortnightly.

Wolverhampton T.C.—The tender of Messrs. Mossay & Co., Limited, London, at £630, has been accepted for the supply of a 2½-ton Orwell electric vehicle and equipment for the removal of ashes from the generating station at Commercial-road, the expenditure to be paid out of the reserve fund.

ROADS AND MATERIALS.

Abergele and Pensarn U.D.C.—An estimate for repairing and tar-painting three roads, amounting to £677, has been forwarded to the Road Board.

Arbroath T.C.—A scheme is to be prepared for the further development of Viewfield-road.

Bath T.C.—The city surveyor, Mr. C. R. Fortune, and several members of the corporation have been appointed as a deputation to visit such places as they think fit to inquire into new methods of carrying out repairs and laying out new streets.—The city surveyor has received instructions to obtain tenders for making up parts of Chaucer-road and Bath-road.

Brighton T.C.—The Tramways Committee recommend tramway rail renewals and the repaving of the front yards with granite, at an estimated cost of £1,700.

Bury St. Edmunds T.C.—The borough surveyor, Mr. W. D. Harding, has received instructions to "make the best arrangements he can" with a tar distiller for the supply of 10,000 gallons of distilled tar if required.

Cheadle and Gatley U.D.C.—The tender of the Taroads Syndicate, Limited, at 1⅞d. per yard super., has been accepted for tar-spraying.

Delvin (Ireland) R.D.C.—It has been decided to adopt direct labour on the whole of the roads of the district.

Dulverton R.D.C.—Owing to the shortage of labour the council have decided to purchase a stone breaker, and are also contemplating the purchase of a tractor and trucks.

Fermanagh C.C.—A large number of new works came before the council last week, and the county surveyor stated that in one case the "road" proposed to be repaired was a little boreen, about the width of a donkey cart; in another case the lane ended in a bog and was little used by anyone; and in another the lane was for the accommodation of one man. All these lanes were illegal, and he was tired of protesting. The council, however, passed all the proposed works.

Flaxton R.D.C.—It has been agreed to accept the offer of the War Office to make a grant of £1 17s towards the repair of roads at Strensall.

Guildford T.C.—The Highways Committee reported that they had selected Mr. T. Davies, of Aberystwyth, as general foreman, but that he had since declined the appointment. They now recommended that the council appoint Mr. W. Chamberlain, of Chesham, at a salary of £3 a week instead of £50s. a week with a house. Mr. Heath said the committee had again been met with the difficulty that as soon as they chose a man his council made it worth his while to stop with them. As they had no suitable house to offer the general foreman, they thought it would be better to pay him another 10s. a week, and let him find his own house. The recommendation was agreed to.

Hertford R.D.C.—The surveyor, Mr. I. W. Riggs, has received instructions to carry out repairs to the road at Bennington leading from Blue Hill Farm, including widening at certain points and the cutting of a ditch to carry off the water.

Kingston (Surrey) T.C.—Of thirteen tenders received for the supply of 1,700 tons of broken granite at 16s. 4d. per ton delivered, that of the London Granite Company has been accepted.—The Highway Committee have informed the Commissioners of Police that they consider no necessity exists in the borough for kerbs to be whitened.

Lowestoft T.C.—The borough surveyor, Mr. G. H. Hamby, has received instructions to prepare plans for making up the road leading from Bridge-road, near Oulton Broad.

Notts C.C.—The county council on Tuesday last decided to postpone a portion of the Road Board scheme in the county, estimated to cost £16,126, thereby reducing the cost of the works to be carried out during the current year to £28,948. Owing to the increased cost of living since the outbreak of war, the

council complied with a request of the roadmen, and advanced their wages by 1s. a week.

Perthshire C.C.—The Perth District Committee have resolved to engage the services of a road engineer to report upon the state of the local roads.

Perth T.C.—It is proposed to relay with tarmacadam the footpath from Princes-street to Craigie, through the South Inch.

St. Germans R.D.C.—The chairman, Mr. John Spear, stated that an inspector from the Road Board had visited the district in connection with the repairing of certain roads, the cost of which would be defrayed by the board. The inspector had suggested that the work should be done by direct labour, and that if the council experienced any difficulty in getting the necessary labour the Government would be prepared to draft men into the district to do the work. Mr. T. Vosper said it was impossible to do the work by direct labour. They could not get the men. It was decided to ask for contracts with regard to the making up of the road at Wearde, which was to be done first.

Sandgate U.D.C.—It has been agreed to purchase 6,000 tons of crude tar from the Folkestone Gas Company at 3d. per gallon.

Sunbury U.D.C.—The Local Government Board having intimated that any loans sanctioned before March 12th which had not been taken up would require further sanction, the clerk, Mr. C. E. Goddard, had written to them with reference to resurfacing the Staines-road at a cost of £1,844. The board have now replied that they are not prepared to give the further sanction at present.

Woolwich B.C.—Two Laffly motor sweepers are to be purchased at a cost of £1,276.

SEWERAGE AND SEWAGE DISPOSAL.

Abersychan (Mon.) U.D.C.—The Building Committee have been asked to consider the question of constructing a sewer from the isolation hospital, at an estimated cost of £300.

Aylesbury R.D.C.—Messrs. Elliott & Brown have prepared a scheme for sewage disposal works in Cambington-lane. The estimated cost, exclusive of land, is £4,960.

Barrowford U.D.C.—The Local Government Board is being asked to sanction a scheme for the extension of the sewage disposal works.

Dorchester T.C.—Subject to the approval of the Local Government Board, it has been decided to make various alterations to the sewage disposal works, comprising extensions to existing tanks, increasing the depths of and false bottoms for filters, the provision of rotary type distributors, extra pumping plant, and laying out further land for irrigation purposes.

Golcar U.D.C.—The council have asked the Local Government Board for authority to proceed with the Crimble sewage scheme, at an estimated cost of £3,500, explaining that they have received an order from the court requiring them to cease polluting the local stream.

Hemel Hempstead T.C.—The borough engineer, Mr. W. R. Locke, is preparing a scheme for the treatment of the sewage from the new isolation hospital.

Maidstone R.D.C.—The surveyor, Mr. T. A. Busbridge, has received instructions to prepare a scheme of sewage disposal for the parish of Bearsted.

Plympton R.D.C.—With reference to a circular from the Local Government Board dealing with co-operation between civil and military authorities in sanitary matters, the medical officer, Dr. Scott, said the effect of the circular was that the Government expected the officers of the district council to supervise the sanitation of all the camps in the district. It was a pretty big order. The Local Government Board promised to recoup the council for any additional expenditure that would be incurred. He did not know how the work was to be done, but he proposed to report on the matter to the Works Committee at an early date.

Pontefract R.D.C.—Plans have been approved by the council for the extension of the Ferry Fryston sewage disposal works.

Seaford U.D.C.—An intimation has been received that the Local Government Board would not raise any objections to the council's proposals for works of sewerage and sewage disposal in connection with the camp, and were prepared to issue their formal sanction to the loan required for defraying the cost on the receipt of a copy of the resolution of the council authorising the application.

Windsor R.D.C.—The clerk reported that in consequence of a communication received at the last meeting, he had, as authorised by the council, written to the Public Works Loan Board asking whether there would be any difficulty arising in advancing the remainder of the loan arranged for carrying out the sewage scheme now in progress. He had received a reply from the board's secretary that if the council satisfied him it was impossible to postpone the completion of the sewage works, or that the scheme was an absolute necessity for the health of the locality, no difficulty would be raised to the remainder of the loan being advanced, but the council should not undertake any fresh work before communicating with the Local Government Board.

WATER, GAS, AND ELECTRICITY.

Ballycastle R.D.C.—A letter has been received from the Local Government Board again asking the council to expedite the arrangements connected with the scheme for the improvement of the Cushendun water supply. The clerk said that the plans were ready, and on receipt of this letter he had forwarded them to the board.

Brighton T.C.—The Lighting Committee recommend the acceptance of the tender of Messrs. Richardsons, Westgarth & Co., at £1,925, for the supply and erection at Southwick power station of a surface condenser.

Clutton R.D.C.—A scheme is under consideration for providing water supplies for a number of parishes.

Coleraine U.D.C.—The clerk stated that a letter had been received from the Public Works Loan Board asking that the instalment on the loan of £1,000 for improvements at the waterworks should be regularly paid. He took it that this meant that the loan had been granted, and he might advertise for tenders for the work.

Kidwelly T.C.—The borough surveyor, Mr. J. Morgan, has prepared a scheme of water supply for Llangadog.

Kingstown U.D.C.—The Dublin and South District Electric Supply Company have executed a deed of transfer of their electric lighting undertaking to the urban district council.

Lampeter T.C.—The improved water supply scheme has been completed at an excess of £200 over the contract price, due to defects found in one of the mains.

Mansfield T.C.—The Local Government Board have sanctioned a scheme, estimated to cost £2,000, for the provision of transforming and converting plant in connection with the electricity undertaking, additional current being required for the Clipstone camp.

Morecambe T.C.—It has been agreed to provide £1,700 in the estimates for the electric lighting of the town.

Nelson T.C.—The gas undertaking produced a nett profit of £5,299 last year, and the electricity undertaking a profit of £1,138.

South Westmorland R.D.C.—The Local Government Board's refusal to sanction the loan for the Meathop water supply is regarded by the council as serious, as the work had been done as a matter of urgent necessity, and partly to provide re-employment. The Local Government Board are to be asked to reconsider their decision.

Taunton T.C.—Having regard to the satisfactory financial position of the water undertaking the council have agreed to transfer from the profits to the borough funds a sum of £770, equal to a 2d. rate.

MISCELLANEOUS.

Bath T.C.—The city surveyor, Mr. C. R. Fortune, has prepared the annual statement as to the cost of the stud and upkeep of the stables for the year ended March 31, 1915. This showed that the cost as a whole had been somewhat less than the previous year, the weight of fodder consumed being 178½ tons, which amounted to 37·78 lb. per horse per day. This included 1·73 lb. per horse per day for extra feeds when engaged upon early and late cleansing. The quantity of litter was 27 tons, or 5·71 lb. per horse per day.

Belfast T.C.—The nett profit of the tramway undertaking for the year ended March 31, 1915, was £52,033.

Guisborough R.D.C.—The clerk reported that a representative from the Local Government Board recently had an interview with the chairman and surveyors of some of the Cleveland local authorities to ascertain what employees were available for war work. The surveyor, Mr. H. D. Woodcock, said if many more men went away for war purposes there would be nothing left for him to do, and he would offer his services for the manufacture of war munitions.

Kingston (Surrey) T.C.—The names of thirty workmen have been furnished to the Local Government Board as possibly available for use in increasing the output of munitions of war.

Southampton T.C.—The tender of Messrs. J. Morris & Sons, Limited, Manchester, at £1,085, has been accepted for the supply of a motor fire engine of 150-500 gallons per minute capacity, complete with 50 ft. fire escape and first aid equipment.

Stowmarket U.D.C.—It has been agreed to purchase for £320 a new fire steam engine out of the surplus possessed by the council.

Twickenham U.D.C.—The names of fifty-eight workmen have been sent to the Local Government Board, with a view to their release if required in connection with the manufacture of munitions of war.

York T.C.—It has been decided that the following works are imperative, and that their abandonment would involve heavy financial loss to the city: Hull road tramways extension; cottages for tramwaymen at Fulford; extension of the electric mains to Strensall, Poppleton, and Naburn; completion of the laying out of the Glen estate at Heworth; cooling tanks at the electricity works; and the purchase of the Tang Hall-lane site for a housing scheme.

PERSONAL.

Mr. S. W. Gibson, surveyor to the Darenth Valley Drainage Board, has received an increase of salary.

Mr. John Edward Stafford, formerly borough surveyor of Burnley, died recently, we regret to state.

Mr. Francis H. French, borough surveyor of Harwich, has been elected a member of the Royal Sanitary Institute.

Mr. Samuel Catley Parmenter, formerly surveyor to the Braintree Urban District Council, who died recently, aged eighty-three, left £33,319.

Mr. J. F. Wardle, surveyor to the urban district council of Wirksworth, has been appointed highways surveyor to the Bolsover Urban District Council.

Mr. L. Howarth, Bournemouth, was on Tuesday last appointed chief sanitary inspector to the Lowestoft Town Council and port sanitary authority at a salary of £200 a year.

Mr. W. Walker, surveyor and sanitary inspector to the Uttoxeter Rural District Council, was presented recently by the council and officials with a clock on the occasion of his marriage.

Mr. E. B. B. Newton, M.INST.C.E., borough surveyor of Paddington, has accepted a commission in the Royal Engineers (T.), and the council have adopted a proposition welcoming his decision to serve in his Majesty's Forces.

Mr. Henry Catchpole and Mr. Henry Arthur Newman have been appointed deputy engineer and deputy surveyor respectively to the Finchley Urban District Council during the absence of the engineer and surveyor (Mr. C. J. Jenkin) in Serbia.

Mr. S. H. Gardner, one of the surveyors to the Southmolton Rural District Council, has been appointed to act temporarily as highway surveyor of the district superintended by the late Mr. R. Kelland. Mr. Gardner had acted on behalf of his colleague during the latter's illness.

Mr. J. C. Haller, the present acting surveyor, was on Tuesday last appointed county surveyor of Nottinghamshire, at a salary of £500 per annum. The council on the same occasion agreed to a reorganisation of the county surveyor's and architect's departments, and a separation of the duties.

Mr. Peter Finnegan, of the county surveyor's office, Monaghan, has distinguished himself in the recent examination in Dublin for qualification as assistant county surveyor, by obtaining first place in all Ireland. Mr. Finnegan has received the warm congratulations of the Monaghan County Council on his success.

Mr. L. Marsden, aged thirty-six, sanitary inspector to the Heston and Isleworth Urban District Council for the past three years, has been appointed to a similar post under the Twickenham Urban District Council, at a salary of £140 per annum, rising by annual increments of £10 to £170, with an additional £10 per annum as inspector under the Game Act and Petroleum Acts. There were 113 candidates.

Mr. T. P. Frank, borough surveyor of Newark, sent in his resignation on Monday. Mr. Frank, it will be recalled, has been selected to fill the office of borough surveyor of Stockton-on-Tees. The Mayor of Newark said they regretted that Mr. Frank was going to leave them, and expressed the town council's appreciation of his services. The mayor's remarks were endorsed by Alderman Atter, chairman of the Highways Committee.

Mr. W. Stubbs, ASSOC.M.INST.C.E., borough engineer of Blackburn, has resigned, after holding office for nineteen years. The salary attached to the position is £700 a year. Mr. Stubbs's retirement is due to failing health. The General Purposes Committee of the corporation have placed on record their high appreciation of his work during the nineteen years he has held the position, and he has been invited to supervise until its completion the Parsonage reservoir scheme which he has organised.

The council of the Institution of Civil Engineers have made the following awards for papers read and discussed during the session 1914-15: The Telford Gold Medal to Mr. A. L. Bell (Rosyth); Telford premiums to Mr. C. W. Anderson (Chakradharpur, India), Sir Thomas Mason (Glasgow), Dr. H. F. Parshall (London), and Mr. H. E. Yerbury (Sheffield); and the Crampton Prize to Mr. F. D. Evans (Kuala Lumpur, F.M.S.). The awards for papers to be published in the "Proceedings" without discussion will be announced later.

Sanatoria Building.—It is of vital importance that sanatoria should be built absolutely free from damp. Tuberculosis is a disease where dryness and warmth are necessary. Many architects for sanatorium work specify that the buildings shall be treated with waterproofed concrete and in all cement renderings. The recently erected Knightwick sanatorium was treated with the powder Pudlo.

Town Planning Institute. At a meeting of this body to be held at 9 Conduit-street, W., on Friday, May 14th, Mr. Thomas H. Mawson, HON.A.R.I.B.A., will read the remainder of his paper, entitled "Some of the Larger Problems of Town Planning"—some extracts from the first portion of which appeared in THE SURVEYOR of March 19th. The annual meeting is now fixed for the afternoon of June 23rd.

FOR OTHER ADVERTISEMENTS
See End of Paper.

BEDDINGTON AND WALLINGTON URBAN DISTRICT COUNCIL.
SURVEYOR.

The above Council invite applications for the appointment of Surveyor to the Urban District. The approximate area of the district is 3,200 acres; rateable value, £120,000; population, 15,300.

The salary will be £300 per annum, and the person appointed must devote the whole of his time to the duties of his office, and not engage in any outside work.

Applicants, who must be over 25 and under 40 years of age, must be thoroughly qualified to undertake all duties in connection with the office of Surveyor to an Urban Authority.

Applications, in candidate's own handwriting, stating age, experience and qualifications, accompanied by copies of not more than three recent testimonials, and endorsed "Surveyor," must reach me not later than 12 noon on Tuesday, 11th May next.

Canvassing in any form is strictly prohibited, and will be deemed a disqualification.

T. BOOTH,
Clerk to the Council.

Council Offices,
Manor-road,
Wallington,
Surrey.
April 28, 1915. (2,558)

SOME RECENT PUBLICATIONS.*

Municipal Office Organisation and Management. A Comprehensive Manual of Information and Direction on Matters connected with the work of Officials and Municipalities. Edited by William Bateson, A.C.A., F.S.A.A., borough treasurer of Blackpool. Price 20s. nett. London: Sir Isaac Pitman & Sons, Limited.

The subject of municipal organisation is of such great importance to the country generally that a new work of the dimensions of the present one requires more than passing comment. The present time, in view of the serious depletion of staffs owing to the European War, seems a most fitting one for the issue of a work on office organisation, as it is only by the most careful attention to system that undermanned office routine, which is so essential for efficient administration, can be maintained satisfactorily.

It will be impossible in the brief review we are undertaking to deal fully with the various sections into which the work is divided, some of which are written by independent authorities, but a few points upon the introduction and opening chapters call for special mention.

Mr. Bateson, in his opening remarks, draws attention to the absolute necessity of a knowledge of detail for successful organisation. At the same time, where extensive areas or municipalities are being reorganised, the chief officer should be equally capable of appreciating the importance of delegating to the assistants under him the multifarious duties and details for which he is responsible. In these days of specialisation and departmental administration, the organiser must be quick to recognise organising ability in others, for the acme of efficiency can only be obtained by individual excellence in all officers. To obtain this effectively, Mr. Bateson points out the necessity of making each assistant or clerk solely responsible to the chief for the work specially delegated to his appointment, and he also emphasises the necessity of written reports.

At last year's annual meeting of the Institution of Municipal and County Engineers, in the discussion upon the paper entitled "Organisation as Applied to a Municipal Engineer's Department," questions were raised as to the inadvisability of written reports as tending to waste of time and lessening of responsibility, but we are of opinion the principle then enunciated, and again set forth in Mr. Bateson's book, cannot be too much emphasised in public offices, where no break in the efficiency should ever be contemplated. In this connection Mr. Bateson rightly points out the disadvantage of abnormal secrecy being exercised by the chief officials and lays down the principle of making the deputy-chief cognisant of all important matters, in order that, should anything untoward happen to the one or the other, no break in the effective administration should occur. Similarly the principle of inter-departmental communications and conferences is advocated, with especial reference to statistical departments.

We notice the old principle suggested in the past by the Local Government Board for the clerk to issue orders for all departments does not appear to be advocated, and with this we entirely agree, since it is the chief of each department who should be solely responsible for the issue of orders, providing duplicates of these are sent to the accountant's or treasurer's department as an additional check.

Useful diagrams are provided showing the various sections into which departmental work can be divided, but these should not be taken too literally, as, although one can see that Mr. Bateson has wisely consulted engineers and surveyors upon these, what may be suitable in one district may often be usefully modified in another.

We ought here to sound a note of warning as to "over-organisation," since, while we agree as to the importance of organisation and specialisation in municipal offices where the number of officials exceed three and four figures, the consideration of any system must be dealt with on broad lines, and the real organiser only adapts to the circumstances of his particular case those factors which will avoid this pitfall. Mr. Bateson also draws attention to the large number of 25,403 local authorities which have the control of local revenues, and the following paragraph indicates the enormous expenditure upon local government and the importance of efficiency in administration.

"In addition to the annual revenue and outlay in current accounts, there was, at March 31, 1912, a responsibility on the principal rate-spending local authorities to repay, within prescribed periods, no less a sum than £413,000,000 in respect of loans raised for public works and purposes; but towards the redemption of this sum there was an accumulated amount of over £22,000,000 standing to the credit of sinking funds and similar funds. Ten years ago the Chancellor of the Exchequer called attention to the fact that in the period from 1880 to 1890 local indebtedness in England and Wales had increased by £62,000,000, and that in the decade from 1890 to 1900 the amount had been further increased by £95,000,000, making an increase of £157,000,000 in twenty years; while the State in that time had reduced its gross capital liabilities by £132,000,000. It is not easy to discover the relationship between local and Imperial loan indebtedness. The former is largely remunerative, but the latter is not."

Most useful chapters in the book are those on the collecting and recording of statistics. These could be studied with advantage by all departments of local authorities. Section 4, dealing with the town clerk's department, has been written by Mr. Arthur S. Wright, and is undoubtedly an excellent *résumé* of the work required by this department. Mr. Wright has also dealt fully with the various Public Acts regulating elections, and the information with regard to committee work, Provisional Orders, arbitrations, and the relationship with Government Departments [illegible] local matters.

In section 5, under the heading of "Finance Department," rate estimates and the intricacies connected therewith are very ably discussed by Mr. Bateson in his usual comprehensive manner. Personally we favour the income and expenditure system, although the receipts and payment system is also dealt with. The importance of a "working balance" cannot be too widely emphasised, as if this is maintained by a municipality considerable economy can be effected in regard to discounts, in addition to obtaining a name for prompt payment, and thus being able to purchase at the very best prices. Mention should also be made of the importance of quarterly statements of receipts and expenditure for submission to the Finance Committee. We have always advocated similar statements for the consideration of every spending committee, and where any material variation occurs above or below the estimate, the chief of the department should lay the reasons for such variations before his committee.

Under section 6, Mr. Harold Greenwood gives a most useful article upon local taxation licences, and we know of no more comprehensive record having been condensed into such a limited space.

In section 7 Mr. Bateson suggests a printing and stationery branch of the finance department. While we agree that this may be advantageous for large municipal organisations, such as the London County Council, the Metropolitan Water Board, or similar authorities, we must again sound a note of warning as to over-organisation, which must be borne in mind by the lesser authorities. In section 8 the public health department is fully dealt with by Mr. Fred Berry, who inclines to the card system. This we agree can be very usefully adopted for public health work, and lends itself to easy reference.

Mr. W. J. Pringle, in section 9, gives a very complete *résumé* of a police department, including fire brigade work, testing of weights and measures, and so forth. It is, of course, clear that the authorities affected under this section are comparatively few; but organisation is none the less important, and the principles set forth and the several tabulations should prove very helpful. Mr. Pringle has also given skeleton plans for central and divisional police stations and other buildings, and, though we think there is room for improvement in the designs, it is helpful to the designer to have the ideas of a gentleman of such known ability as Mr. Pringle, who is the chief constable for the county borough of Blackpool. The details as well as the administration charts are most comprehensive, and should prove of exceptional utility to new county boroughs when taking over police administration. We are not fully in agreement that police and fire organisation should necessarily be controlled by the same chief, as we consider that in large municipalities there is room for two entirely separate departments, while with the smaller authorities it is often more desirable for the fire protection department to be under the engineer to

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

the council. The importance of organisation, however, is equally great in either case, and the information given as to fire brigade work is very useful.

In section 10 Mr. Percy Farnworth, borough treasurer of Bolton, deals with both the history and management of parks and pleasure grounds, and gives a brief *resume* of the powers of local authorities, with information as to by-laws and charges. The same writer similarly treats cemeteries and burial grounds under section 11, and the numbering method shown on the diagrammatic plan of a cemetery could be usefully considered by any local authority taking over the duties of a burial board.

Baths and wash-houses in section 12, and markets and fairs in section 13, are both dealt with by Mr. Farnworth, and call for no special comment.

In sections 14 and 15 the working of the Old Age Pension and National Insurance Acts are fully explained by Mr. Bateson himself, and the tables and information given in connection with the latter should be of great benefit to all municipal authorities.

Mr. Walter Powell, chief librarian of Birmingham, gives a very excellent *résumé* of public library work in section 16, mentioning briefly the card charging system as applicable to both "closed" and "open access" libraries. Mr. Powell appears to have very carefully considered the needs of borrowers, and his section of the work and the several forms for comparative statements should be read by all librarians.

Under the head of municipal trading Mr. E. Cooke deals with gas undertakings, Mr. S. B. N. Marsh writes upon a tramways department, and Mr. F. J. Alban is the author of an article on waterworks; but we are not informed as to the authorship of electricity departmental organisation. These four sections may briefly be considered as trading departments, and as such are upon a somewhat different plane to all the others, although we incline to the opinion that waterworks should not technically be described as a trading department, the efficient supply of water being an absolute necessity.

It is impossible, in the limited space at our disposal, to review fully the excellent suggestions made by the several specialists, but from a preliminary perusal we consider that, although in detail there may be room for some modifications, the principles enunciated are excellent, and can form the basis for the creation or remodelling of departments with proper organisation which should lead to ultimate economy.

Mr. R. Eccleshall, in section 21, deals with the justice's clerk's department, while in section 22 Mr. W. S. Body writes upon housing and town planning. We are of opinion that this latter section could have been treated in a more elaborate manner, although the brief *résumé* given by Mr. Body is excellent from the layman's point of view.

We are somewhat surprised that such a limited space should have been allocated by Mr. J. E. Pickles to the education department, this being one of the principal spending departments connected with a large municipality; but what has been indicated in the few pages given to it should be of considerable utility to those whose education departments require reorganising. We are also somewhat astonished at the limited space allowed to sections 24 and 25—viz., the surveyor's department and the sewage disposal works. In the latter case we are informed the author is Mr. J. D. Watson, the able chief engineer to the Birmingham, Tame and Rea District Drainage Board, and that is sufficient to indicate that the subject matter is well worth careful perusal. There is, however, room for further suggestions in regard to the surveyor's department, and we anticipate that in any future issue this will be amplified. As a whole we can confidently recommend this book as one which should find a place upon the library shelves of every municipal officer, and we feel sure that it will for many years remain the standard work upon the subject. In conclusion we must compliment Mr. Bateson upon the ability and energy he has displayed in bringing together so much useful data upon a subject which is so bound up with efficiency in municipal administration, and we confidently anticipate that his work will be widely read.

The Modern Factory: Safety, Sanitation and Welfare. By George M. Price, M.D. Price 17s. nett. London: Chapman & Hall, Limited.

The scope of this work, which is published in New York by Messrs. John Wiley & Sons, is indicated by the title and sub-title. The subjects dealt with are of the greatest importance from the point of view of public health, having regard to the very large proportion of the population which to-day finds employment in factories. A preliminary chapter deals with the factory, its rise, growth and influence, while among the more important matters subsequently considered may be mentioned fires and their prevention, accidents and safety, light and illumination, factory sanitation, air and ventilation, industrial dusts and dusty trades, industrial gases, poisons and fumes, and factory legislation. The book may be described as a comprehensive review of the safety and sanitary conditions of factories and workshops as they are, together with an account of the methods of safety, sanitation, efficiency and welfare of factories and workshops as they should be.

Masonry as Applied to Civil Engineering. By F. Noel Taylor. Price 6s. nett. London: Constable & Co., Limited.

Although the introduction of steel and reinforced concrete has to a certain extent ousted masonry from the supreme position which it formerly occupied as a material of engineering construction, it is still used to a very large degree for certain classes of work. In setting forth the theoretical considerations with regard to masonry structures, therefore, the author of this work is dealing with a subject of practical importance. The first chapters are devoted to a description of the several stones used in constructional work, and to a discussion of labour on stones. The structures dealt with in later chapters are retaining walls, dock and sea walls, dams, bridges, towers and pillars. Finally, the subjects of monolithic construction and shoring and underpinning are discussed. The book is clear in style and copiously illustrated, while the author has, as far as possible, avoided the use of the higher mathematics.

SEWAGE WORKS MACHINERY.

GAS ENGINES REPLACE OIL ENGINES AT SUNBURY.

Mr. H. F. Coales, the surveyor, has presented an exhaustive report on the condition of the engines and machinery at the Sunbury Urban District Council's outfall works, and outlining a scheme the council has had in view for some time as to replacing the old and now inefficient oil engines. A new gas engine and air compressor had been installed, and had been tested over a period of fifteen months with very satisfactory results. The average running cost per hour of the gas-engine plant was a little under 4½d., while the cost of the two oil engines—the combined power of which does not equal that of the gas engine—was 2s. per hour. The average cost of oil used at the works prior to the installation of the gas engine was £400 per annum, and the estimated cost for gas engines would be £108, or an average saving of £292 per annum.

In view of these figures and the absolute necessity of providing a duplicate plant, the surveyor recommended the council to proceed with the laying down of a second gas engine, plant, and air compressor, and to remove the two old oil engines, which would be credited in the contract. The new machinery would be in duplicate, the engines could be worked alternately, and the wear and tear of continuous running would be avoided. There was just sufficient room in the engine-house and generation shed for the new machinery, so no structural alterations would be necessary. Estimates were submitted for different types of engines, the one recommended being a 66 max. h.p. Hornsby-Stockport gas engine and gas plant, and a 550 cub. ft. Reavell air compressor at a cost of £760. A compressed-air self-starting apparatus was also recommended to be fitted to the present gas-engine. An extra £100 would be required to provide for removing the old engine foundations, and making new foundations, new pipe trenches, alterations to pipes, &c., bringing the total outlay to, approximately, £860.

It was unanimously agreed to purchase the new plant recommended, subject to the consent of the Local Government Board, and Mr. Coales was warmly complimented on his clear report.

National Housing and Town Planning Council.—The council of the Society of Architects have, at the invitation of the National Housing and Town Planning Council, appointed delegates to attend a series of conferences which are being held in London on April 20th and 21st, Edinburgh April 27th and 28th, Liverpool May 12th and 13th, and Leeds May 19th and 20th.

Institution of Municipal Engineers.

MEETING AT NEWARK.

Members of the North-Eastern and Eastern Districts of the Institution of Municipal Engineers met a most enjoyable time at Newark-on-Trent, Notts, on Saturday, when various interesting buildings, ancient, restored and modern, were inspected, explanations of same being given by the local members, Mr. H. W. Lockton, M.S.A., and Mr. P. A. Watford, surveyor to the Claypole Rural District Council. The members were received at the town hall by the mayor, Mr. J. C. Kew, who welcomed them to the old and ancient borough of Newark, and gave a most interesting particulars of the town hall, which was built in 1773. H. Wright called their particular attention to the ball-room, which is considered to be one of the best Adams rooms in the country. The mayor's chain of office and the magnificent corporation plate, which were on view, were greatly admired by the members, the mayor explaining that in the Civil War some of the plate was melted down, the "siege pieces"—money relics of the "silver bullets" of the days when Newark was besieged being in existence to-day.

A visit was then paid to Newark Castle, where Mr. P. A. Watford pointed out, among other things, the Norman gateway, the room in which it is supposed that King John died on October 18, 1216; and the stones temporarily housed in the crypt which were dredged from the river Trent, and believed to be part of a Roman [illegible] wheel, the site of the castle built in 1130 by Bishop Alexander being previously that of a Roman [illegible].

The Ossington Coffee Palace, Trent Bridge, and Grestrap Library were pointed out by Mr. H. W. Lockton, who afterwards gave an explanatory statement in regard to the parish church, where the organist, Mr. W. T. Wright, A.R.C.O., gave a short, but much appreciated, organ recital.

An inspection was then made of the restored Tudor hall in the Old Magnus Buildings, formerly the Magnus Grammar School, and now in the hands of the borough elementary education authority for various educational purposes. Other interesting buildings examined were the shop which was formerly the Old Moot Hall, where the courts were held of the important Manor of Newark; the house occupied by the Governor during the Siege of Newark; old inns, such as the "Clinton Arms," "White Hart," and "Saracen's Head," which last-named has been in existence 1341, the shop where Byron's first poems were printed, Beam end Close, dating from 1330; the hospital, built in 1880; and the new Magnus Grammar School, designed by Messrs. Sheppard & Lockton, and built comparatively recently, at a cost of £10,000, excluding the cost of the land.

Before leaving the town hall, Mr. W. Matthews Jones, the president of the institution, voiced the thanks of the members to the mayor for his kindness in receiving them and giving them such a welcome.

The Mayor, in response, said he was glad to have an opportunity of recognising the good work and the high status of the profession which they represented.

Mr. W. Matthews Jones also cordially thanked the head master at the Magnus Grammar School for his courtesy, and said he felt sure that under such a talented head master the scholars who had the privilege of attending that magnificent school would have a splendid start in life.

Rev. H. Gorse, in acknowledgment, said they were very proud of their grammar school in Newark, as they were of most things in the town, and he could only hope that they would get as good a school in their respective towns as Newark had, and also get as good and real support from the inhabitants of their town as the Magnus Grammar School received from the people of Newark.

Tea was served at the "Saracen's Head Inn" by Host C. Smith, and the subsequent proceedings were of a most interesting character.

Mr. W. Matthews Jones (Chester) presided, supported by the Mayor of Newark, Mr. J. C. Kew. Also present were: Messrs. H. W. Lockton (Newark), P. A. Watford (Claypole), John Bailey (Spalding), C. A. Howard (Brigg), A. Harford-Stevens (Blaby), Geo. Mathews (South Holland), G. A. Penwill (Peterborough), G. H. Kemp (Newark), F. Harrison (Newark), J. S. Ewart (Bridgford), G. Wooldridge (Newark), F. H. Ellis (Sleaford), A. Parry (Sleaford), W. G. Shepherd (Kesteven), R. J. Kettleborrow (Belvoir), R. Parker (Southwell), R. Madins (Newark), G. Belson Chilvers, hon. district secretary, and B. Wyand, secretary of the institution.

The PRESIDENT, having given a few historical facts in regard to Newark and Chester, said that the members had been particularly interested in the various places they had visited, both ancient and modern, and especially by the beautiful parish church. In this connection he paid a warm tribute to the skill of the organist, Mr. W. T. Wright. It was very gratifying to see that the people of Newark were keeping up their old structures, but, coming from an ancient city which was particularly jealous of its ancient monuments, he must say he had seen some things in Newark which would not be tolerated in Chester. At the rear of the house occupied by the Governor at the Siege of Newark he found some fine half-timbered work which had been whitewashed over. In another instance he found that a tradesman had put a frightful sign over some very beautiful old work. Speaking of their institution, he said it was formed so that the members might derive benefit from meetings such as they had had that day, where members could take back to their own towns impressions which would be of value to them. Their object was to improve their minds and improve themselves, and so to help others. There was one matter of regret he would have to mention. He noticed in THE SURVEYOR they were advertising for a surveyor and engineer to their corporation, but the advertisement said the gentleman appointed must be an associate-member of the Institution of Civil Engineers or of the Institution of Municipal and County Engineers. Nothing was said of the Institution of Municipal Engineers. They as a body considered themselves quite equal if not in advance of the Institution of Municipal and County Engineers, their members having to have practically the same qualifications, but they were debarred by the advertisement from applying for the appointment. He hoped if any member of their institution were among the selected candidates, he would have an opportunity of expressing his views.

In conclusion the president cordially thanked the Mayor for his kindness.

The MAYOR, in response, thanked the president for his references to Newark, where he saw they maintained appreciation for the noble town, with its glorious history and traditions. He was very glad to have met the members, because it was always a good thing to get new ideas. He had heard with interest what had been said of Chester with regard to what they did to individuals who despoiled ancient property which they had purchased, over which, he took it, the local authority had no control. He hoped what he had heard would bear fruit if ever in Newark they had a chance of interfering with any projected vandalism which might occur in their midst. They did treasure the premises which the president had referred to, and were glad that even so much remained intact. He was pleased to meet them because their profession had a great bearing upon the public life of the country, and especially upon public health. The amenities of our towns were largely in their hands. They had to do with new buildings, town planning, and the opening out of old courts, and replacing of old worn-out buildings; also those matters of sanitation which had so much influence on public life. Speaking of the parish church, he said it had been his pride and privilege to have succeeded in raising nearly £2,000 for the repair and restoration of the tower. The mayor also referred to the restoration of the Tudor Hall, which they had visited, and reminded them that the work had been carried out by one of their members, Mr. Lockton. As a Newarker he was proud to think they had recovered this splendid structure from what was most unpromising material when it fell into the hands of the corporation. He hoped the new school designed by Mr. Lockton would for many years remain a memorial to that gentleman's ability. With regard to what the president had said concerning the advertisement for a new borough surveyor and engineer, he could only hope it would

not prevent members of their association applying. There was no doubt Newark was a stepping-off place for able young men, and he instanced the case of the present borough surveyor, who was leaving a post at £250 to take one which would rise to £750. He hoped all their members would not only improve their minds, and acquire knowledge, but be ambitious and keep before them high ideals of the public service.

The function concluded with votes of thanks to Mr. G. Belson Chilvers, the hon. secretary of the district; Mr. W. T. Wright, the organist; Mr. Ewart, who after tea gave a musical monologue and a ventriloquial sketch; and Mr. Lockton and Mr. Watford for arrangements made by them in the planning of a very enjoyable day.

VISIT TO LONDON NEW COUNTY HALL.

By the permission of Mr. W. E. Riley, the council's official architect, a visit was paid on Saturday, April 24th, by the members of the Southern and South-Eastern Districts of the institution to the new County Hall works of the London County Council. Among the members present were Messrs. Horace Boot and E. A. Stickland, past-presidents of the institution; John Denton (Tettenhall), C. A. Trimm (Kingston-on-Thames), T. C. Barralet (Godstone Rural District Council), F. Leslie Morrison (Islington), H. J. Higgins (Lewisham), G. E. Gulliver (Lewisham), and Arthur Palmer, honorary secretary of the Southern district, and a number of visitors also attended. The party was conducted over the work by Mr. Gilbey, the assistant clerk of works, who answered questions galore, and carefully explained the various aspects of the work and of the drawings to the entire satisfaction of everyone.

The building, so far in carcase only, is of a composite construction—viz., brick with stone facings, upon a steel framework, the whole standing upon a horizontal concrete raft of 5 ft. depth at one level—*i.e.*, without the usual footing courses.

This raft, being considerably below high-water mark, is held intact by a heavy granite embankment wall built very deep upon wood piles, due allowance being made for the natural actions of the river and periodical dredging. The stonework upon all façades is of Cornish granite and Portland stone, the latter of which has all been worked in London.

The Council Chamber on plan is approximately central, with the departments and offices built upon the square about it. The chief façade fronts upon the Thames, with a members' private terrace in crescent form at a level well above the public embankment. It is this central feature, with its 38-ft. columns which appears to receive the bulk of the architectural beauty in elevation, thus breaking the somewhat plain monotony of the outer flanks.

The approximate estimated cost of the building was £1,500,000, and the site occupies an area of some 5½ acres. An excellent model of the whole building to scale was shown to the party prior to their departure giving a very good idea of what its appearance will be on completion.

Fire-Resisting Glazing.—Two reports have been issued by the British Fire Prevention Committee on recent investigations undertaken by them with wired glass as applied to window openings and to skylights. These tests are a continuation of a series of tests with wired glazing, which they started some ten years back at the instance of Messrs. Pilkington Brothers, Limited, of St. Helens, and the series of some seven reports, spread over the last decade, shows the remarkable manner in which the fire resistance of glazing of this type has been successfully developed. The two reports now presented afford remarkable evidence of the fact that wired glazing, when used vertically in windows, has withstood the heavy strain of the British Fire Prevention Committee's tests for a period of ninety minutes at temperatures gradually increasing to 1,500 deg. Fahr., the fire tests being immediately followed by the application of water from a steam fire engine applied at close range. Further, when used horizontally, this glazing has withstood a fire test of an hour's duration at similar temperatures, followed by a similar application of water. The maximum size of any piece of glazing under test in a vertical position was 4 ft. by 1 ft., and the maximum temperature attained in the skylight test was 1,600 deg. Fahr. Both tests are records for wired glazing, and claim considerable attention, as they put modern wired glazing, when suitably fixed, in the same fire-resistive rank as fire-resisting partitions and doors of considerably greater thickness and weight.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it not to be hoped that the Departmental Committee of the Local Government Board who are investigating the question of the weights on the axles of heavy motor cars on our roads will take a broad view of the question, and, while endeavouring to safeguard our roads from vehicles which are known to be disastrous to them, will take care not to cripple the industries of the country by imposing restrictions which may be difficult or even impossible for the manufacturer to meet?

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Are not some of the principal points to be considered by the committee weight and speed, and the construction, diameter, width and character of the wheels and tyres? In connection with this, will it not be necessary for the committee to carry out some experiments, as there is at present much contradictory evidence as regards the damage caused by solid rubber twin tyres as against iron tyres? And is it not sometimes contended that the former type of tyre is the most damaging that can be used on a road?

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Were any municipal surveyors present on Thursday, the 22nd inst., at the annual meeting of the Roads Improvement Association? Would they not have been rather interested to have heard from a member of the Enfield Council that the landowners there are so powerful that they run the council? Would they not also have been interested to hear that several of the larger corporations are now so convinced of the good work done by the association that they are contributing annual subscriptions towards its support?

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What has been done with the special committee of the Royal Sanitary Institute on the "Abolition of Privies and Pail-closets"? If it is still in existence should it not take to heart the excellent letter of "Thothmes" in last week's issue of THE SURVEYOR, in which the danger of stored fæcal matter and flies is pointed out? Is it not to be greatly regretted that the Royal Commission on Sewage Disposal did not "dispose" of such methods of sewage "treatment" once and for ever?

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What is the trend of modern road construction at the present time? Is it towards a thin carpet of artificial asphalt, as some road engineers contend, or is it still in the direction of some form of tar-macadam, including, of course, tar-slag? Is it a fact that "tar" grouting is going out of favour because with this process the amount of grouting used must be excessive if anything like a successful result is to be obtained?

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What is the reason for the sudden activity of the council of the Institution of Civil Engineers? Why is it that, in addition to making an attempt at fixing the fees to be charged by their members for professional services, they are now proposing to call a special meeting to amend some of the by-laws? How long was it that the celebrated Rip Van Winkle slept? And have we any information as to what he did when he awoke?

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Will it not be a grievous pity if the proposed bridge over the Thames at Goring is to be a toll-gate bridge? Is it not common knowledge that such toll bridges have all eventually had to be freed at enormous cost to the ratepayers? And is it not to be hoped that the respective counties of Berkshire and Oxfordshire will be able so to finance the commissioners that the bridge will be a free one on completion?

Scarborough's Town Planning Scheme.—The Scarborough Town Council have adopted a comprehensive scheme of town planning and housing. The areas affected are in the Central and East Wards, the oldest and most congested districts in the town, and the scheme includes the construction of a new thoroughfare from the Newborough-street end of North-street (near the site of the Old Bar) to a point on the Sandside near the entrance to the Marine-drive and Promenade, the length of the new street to be approximately 1 mile. The scheme will be carried out in sections, the work being spread over a number of years.

ROADS IMPROVEMENT ASSOCIATION.

ANNUAL GENERAL MEETING.

The Hon. Arthur Stanley, C.V.O., M.P. (vice-president), occupied the chair at the twenty-eighth annual general meeting of the Roads Improvement Association, held at the Institution of Civil Engineers on Tuesday, the 22nd inst.

Mr. Robert Todd Chapman, who moved the adoption of the annual report, drew attention to the more important features of the association's activities during the past year. He emphasised the great good that had come from the association's conferences with road surveyors. Although the Horseshoe Competition had not succeeded in producing an ideal stone to meet modern road conditions, it had stimulated much general interest, and had demonstrated that there were other ways of dealing with alleged slippery roads than grumbling about them. The association proposed to continue its strong opposition to the re-enactment of the tax of 1d. per ton upon motors in any form whatever, and it was encouraging to note that the Government Departments were supporting this view. The report specified a very large number of actual improvements in various areas throughout the country upon which the association had been engaged. Every year saw a great increase in the association's activities, in spite of the marked improvement that had taken place in the condition of our roads during the last few years. Good roads were becoming more and more vital to the successful handling of commerce and the comfort of present-day life.

In seconding the report, Mr. W. Joynson-Hicks, M.P., congratulated the association upon its successful year's work. He was particularly gratified to notice how, during the last year or two, there had been a growing tendency for more consideration to be extended to all road users by local authorities and by the law courts. This was largely due to the educational work of the association.

The fact that the association had given considerable attention to the alleged needless damage caused to road surfaces by fast motor vehicles was remarked upon by Mr. W. Worby Beaumont. A report had been prepared in which certain alterations were suggested to the existing Local Government Board's regulations regarding heavy vehicles which it was thought would be more fair towards the owners of the vehicles, in addition to reducing the strain of such traffic on the roads. The matter was still receiving attention.

Mr. E. S. Shrapnell-Smith (hon. treasurer), in moving the adoption of the accounts, pointed out that the association had finished up last year with a small balance in hand of £96. Many economies had been effected for the carrying on of the work during the ensuing year, but, as the association only had a very small reserve—less than a year's income—he was counting upon a full measure of support from the constituent bodies for the current year. As definite evidence of the association's increasing influence with the authorities, and the growing recognition of the importance of its work, he was pleased to announce that the corporations of Liverpool, Bradford, Blackpool, Sheffield and Hornsey had this year intimated their intention of becoming subscribers to the association, and he believed several others would follow this example.

Speaking in support of the accounts, Mr. H. Percy Boulnois stated that, as an old municipal officer, he would emphasise the importance of the hon. treasurer's last announcement. Subscriptions of this character were only given by corporations after very careful consideration, and they demonstrated very definitely the confidence in the association and the utility of its work. He drew attention to the smallness of the association's annual income—barely £1,000—and considered that the amount of work it accomplished was remarkable.

Votes of thanks to the council and officers for their work in the past year, and to the chairman, the Hon. Arthur Stanley, M.P., for presiding, concluded the meeting.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—**The rapid increase of sand wastes around our coasts is indeed a serious one, and Mr. Case has done a valuable work in the writing of this book.**—*Southport Guardian.*

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. S. Pickering, M.Inst C.E., Borough Surveyor and Water Engineer, Cheltenham.

METROPOLITAN DISTRICT MEETING.

A Metropolitan District meeting is to be held this (Friday) evening at the offices of the institution, 92 Victoria-street, Westminster. All members in Greater London are specially invited to attend.

AGENDA.

7.30 p.m.—(1) To confirm minutes of the meeting held on March 26, 1915.

(2) To receive report of the secretary of the institution as to the election of district officers.

(3) To appoint Executive Committee.

(4) To consider communication from the council in reference to the question of heavy traffic. Discussion to be opened by Mr. O. E. Winter (Hampstead), as follows:—

(*a*) Construction of motor vehicles and traction engines.

(*b*) Approval of routes by road authority.

(*c*) Contribution by owners of vehicles to cost of road maintenance.

Norman Scorgie,
Hon. Secretary pro tem.

Hackney, N.E.

SCARBOROUGH MEETING.

An institution meeting will be held in the North-Eastern District at Scarborough on Saturday, May 8th.

Programme.

10 a.m.—Assemble at the town hall.

10.15 a.m.—Reception by his Worship the Mayor (Mr. C. C. Graham). A paper entitled "Catering for the Wants of the Holiday-maker," by Mr. Harry W. Smith, Assoc.M.Inst.C.E., borough engineer and surveyor, will be taken as read. Any discussion thereon may take place at the close of the meeting after the various works have been inspected.

10.45 a.m.—Inspection of Spa improvements, beach bungalows, South Cliff Gardens, bathing pool, &c., in the South Bay.

1 p.m.—Lunch at the Grand Hotel. (Tickets, 3s. each.)

2 p.m.—Meeting of the members of the North-Eastern District to consider—

(*a*) The report of the Executive Committee as to the desirability of reporting the proceedings of district meetings in the Press.

(*b*) Any other business.

2.30 p.m.—Leave the Grand Hotel by char-à-banc (tickets 2s. each) for the Castle Hill, to view the damage caused by the bombardment on December 16, 1914, by the German battleships, and to inspect the Keep.

3.15 p.m.—Leave the Castle Hill, and inspect the Alexandra Gardens, Floral Hall, Peasholm Park, and the beach bungalows and bathing establishment in the North Bay.

4.30 p.m.—Leave the north end of the Royal Albert-drive by motor char-à-banc for drive along the Marine-drive, Valley Park, to the Mere.

5.15 p.m.—Afternoon tea at the town hall by the kind invitation of his Worship the Mayor (Mr. C. C. Graham).

AYR MEETING.

At the Scottish District annual meeting to be held at Ayr on June 4th and 5th, papers on town planning, municipal housing, road work, and scraping of water mains will be submitted.

On the first day visits will be paid to the municipal works of the town, and the following day will be devoted to inspections of experimental road stretches in Ayr County and Hillhouse Quarry, and to a visit to Loch Doon.

MATLOCK MEETING.

The arrangements for the institution meeting to be held at Matlock on June 12th include visits to the new sewage works, the brine and electric baths, and other undertakings.

J. W. Dudley Robinson,
Secretary.

92 Victoria-street, S.W.

CONCRETE INSTITUTE.

The sixth annual general meeting of the Concrete Institute will be held at Denison House, Westminster, S.W., on May 6th, at 7.30 p.m., after which discussion will be resumed on Mr. Osborn C. Hills's paper entitled "The London Building Acts, with some Suggested Amendments."

The paper by Mr. E. A. W. Phillips, M.Inst.C.E., M.C.I., entitled "Lime Concrete in the East," which was to have been read on May 6th, will be read on May 22nd, at Denison House, Westminster, S.W., at 7.30 p.m.

It has been decided to abandon the fifth annual dinner this year.

H. Kempton Dyson,
Secretary.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ROAD FOREMAN.—May 1st.—Denbigh Town Council.—Mr. E. Parry, town clerk.

INSPECTOR OF NUISANCES.—May 3rd.—Corporation of Bradford. £95 per annum.—Mr. F. Stevens, town clerk.

BOROUGH SURVEYOR.—May 3rd.—Corporation of Newark. £250 a year.—Mr. Godfrey Tallents, town clerk.

SANITARY INSPECTOR. — May 5th. — Newport (Salop) Urban District Council. £121 per annum.—Mr. J. S. Underhill, clerk.

GAS ENGINEER AND MANAGER.—May 7th.—Corporation of Stoke-on-Trent. £500—£700 per annum.—Mr. E. B. Sharpley, town clerk, Town Hall.

SEWAGE WORKS MANAGER.—May 8th.—Bingley Urban District Council. 45s. per week.—Mr. Alfred Platts, clerk, Town Hall, Bingley.

SURVEYOR AND SANITARY INSPECTOR.—May 8th.—Wirksworth Urban District Council. £90 per annum.—Mr. J. Gratton, solicitor and clerk, Town Hall, Wirksworth, Derbyshire.

ASSISTANT TO SURVEYOR.—May 8th.—Maidstone Rural District Council. £2 10s. per week.—Mr. Thos. A. Busbridge, surveyor.

GASWORKS ENGINEER AND MANAGER.—May 10th.—Spalding Urban District Council. £150, with residence.—The Clerk, Urban District Council.

INSPECTOR OF NUISANCES.—May 10th.—Annfield Plain Urban District Council. £130—£150.—Mr. T. L. Watchman, clerk.

BOROUGH SURVEYOR. — May 15th. — Newport (I.W.) Town Council. £225—£250 per annum.—Mr. T. Ross Pratt, town clerk.

CLERK OF WORKS.—Tyldesley Urban District Council. £2 10s. per week.—Mr. Francis E. Jones, engineer and surveyor, Council Offices, Tyldesley.

ASSISTANT ENGINEERS.—Public Works Department, Government of the Gold Coast. £350—£400 a year, with furnished quarters.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ENGINEER.—Public Works Department, British Guiana. £300—£400.—Crown Agents for the Colonies, Whitehall-gardens, S.W.

ENGINEERING AND SURVEYING ASSISTANT.—Derbyshire County Council. £150 per annum.—County Surveyor, County Offices, Derby.

TEMPORARY ROAD FOREMAN.—Corporation of Cheltenham.—Borough Engineer, Cheltenham.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

CARLISLE.—May 4th.—For pulling down property and clearing sites, for the corporation.—Mr. H. C. Marks, city engineer and surveyor.

DUNDEE.—May 5th.—For alterations to the office premises, for the parish council.—Mr. T. M. Cappon, architect, 32 Bank-street, Dundee.

LAMBETH.—May 6th.—For covering-in with corrugated-iron sheets, and the provision and erection of sliding doors at the depot, for the borough council.—Borough Engineer, Town Hall, Brixton-hill, S.W.

HUDDERSFIELD.—May 7th.—For the extension of the filter-house at Longwood reservoirs, for the corporation.—Waterworks Engineer, Town Hall.

DARTON.—May 10th.—For the erection of boundary walls and other works, for the urban district council.—Mr. S. Wilkinson, surveyor.

HOLYWOOD.—May 10th.—For the construction of a storage reservoir, filter and auxiliary works, for the urban district council.—Mr. J. A. Hanna, engineer, Ocean Buildings, Belfast.

GLASGOW.—May 13th.—For the erection of a sanatorium and children's home, for the corporation.—Mr. J. Lindsay, town clerk, Glasgow.

EAST LANCING.—May 17th.—For the erection of seven timber groynes at Shoreham, for the Sea Defence Commissioners.—Messrs. R. B. Grantham & Son, civil engineers, 5 Little College-street, Westminster Abbey, S.W.

Iron and Steel.

RICHMOND (Surrey).—May 5th.—For the supply of 100 tons of heavy cast-iron pipes and special castings, for the corporation.—Mr. J. H. Brierley, borough surveyor, Town Hall.

ST. PANCRAS.—May 11th.—For steel constructional work, for the borough council.—Mr. C. H. F. Barrett, town clerk.

WELLINGBOROUGH.—May 12th.—For the erection of a steel Dutch barn at the sewage farm, for the urban district council.—Mr. R. S. Henshaw, engineer and surveyor.

GOSPORT AND ALVERSTOKE.—May 13th.—For the supply of a pair of 18-in. stroke horizontal cross high-pressure, double-acting air compressors, with all necessary valves, pipe connections and foundations, for the urban district council.—Mr. H. Frost, engineer and surveyor, Gosport.

Roads.

ROMFORD.—May 3rd.—For the supply of broken granite and granite chippings, for the urban district council.—The Surveyor.

SWANAGE.—May 3rd.—For providing materials and labour for tar-spraying, for the urban district council.—Mr. W. H. Pearce, surveyor.

ELHAM.—May 4th.—For the supply of granite and basalt, for the rural district council.—The Highway Surveyor, Lyminge, Kent.

CAERLON.—May 4th.—For the execution of kerbing, channelling, and paving, for the urban district council.—Mr. T. R. P. Herbert, clerk, Skinner-street, Newport, Mon.

LLANDAFF.—May 5th.—For the supply of mountain limestone, for the rural district council.—Mr. James Holden, surveyor, 20 Park-place, Cardiff.

ST. GERMANS.—May 5th.—For remaking part of a road, for the rural district council.—Mr. F. E. Cleverton, clerk, 4 Buckland-terrace, Plymouth.

BROMSGROVE.—May 5th.—For the supply of 500 tons of 2½-in. machine broken granite, and 400 tons of unbroken granite, for the urban district council.—The Surveyor.

FULHAM.—May 5th.—For making up a new street, for the borough council.—Mr. F. Wood, borough surveyor.

BRUMBY AND FRODINGHAM.—May 7th.—For the supply of 800 tons of whinstone, for the urban district council.—Mr. Joe Green, surveyor, Council Offices, Frodingham, Scunthorpe, Lincs.

EAST ASHFORD.—May 8th.—For the supply of 300 barrels of tar, for the rural district council.—Mr. J. Kingsford, clerk, 7 Bank-street, Ashford.

JARROW.—May 8th.—For the cementing of footpaths, for the corporation.—Mr. J. Scott Weir, borough engineer, Town Hall.

MIDLOTHIAN.—May 8th.—For the supply of tools, ironmongery, brushes, oils, and other articles, for the roads department.—Road Office, County Buildings, Edinburgh.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Public Soft-water Supplies.

Can a case be made out for a public soft water supply in addition to the ordinary water works, where the latter service provides a very hard water? It is a matter for consideration. Of course, the proposal is quite possible of accomplishment, but is it desirable? We know only too well the disadvantages in the use of very hard water. While for potable purposes it may be very palatable, and in some respects good for the younger generation, there are the outstanding objectionable qualities—the waste of soap and the incrustation of boilers and pipes. The housewife and the manufacturer are at one in their condemnation of very hard water. The housewife cannot extract the best from her tea or her dolly-tub, and the manufacturer is compelled to employ a solvent composition in his warfare against the formation of scale in his boiler. Most people have their own limited private supply of rain water, but, unless it is very carefully conserved, it will fail at some time or another when used freely for baths and general cleansing purposes. And once this supply has given out, the unhappy householder can do nothing to replenish it—he must use hard water. The domestic tank, too, often becomes fouled by the washing in of impurities from the roofs. The water not seldom is highly coloured and offensive to the smell, particularly when heated. Now the ideal conditions for the householder would exist if he were given an abundant constant supply of clean, soft water from a source beyond the sooty atmosphere of a town. How is it to be done? In the usual way, as from other water supply works—the construction of an impounding reservoir in a suitable watershed; the collection of rain water in showery seasons; and the delivery of it through a system of pipes at a constant pressure. The water not being required for drinking purposes would not need to be filtered. Such an auxiliary supply would mean a very much less general consumption of the ordinary hard water. The effect of this would be that the latter supply would last a town for a much longer period without augmentation. Further, the hard water could be treated as a more valuable commodity than the soft unfiltered water, which could be used for all general purposes, such as cleansing, swilling, and the sanitary services. There are objections to a duplicate system of water pipes in a town. Not only is there the expense of the two sets, but the liability of the workmen inadvertently tapping the wrong main. As against this objection, however, the two sets of pipes could be proportionately smaller than in the case of a single system. It would seem that a small rain-water supply main would be all that was necessary if people had adequate storage tanks upon their premises, for in such a case the replenishment would be continuous night and day.

Taking all the above points into consideration, is a municipal engineer likely to recommend to his council a soft-water in addition to a hard-water supply? One cannot think that he is, in spite of what has been advanced in favour of the two. Is there an alternative system? The obvious answer is: Soften the hard water and supply it in one set of pipes—kill two birds with one stone in fact. But there are objections to a softening system too. If the water is made quite soft, it is not so good for potable purposes as hard water, and if it is only softened down to a certain extent it is not such a good cleanser as rain water. There again it seems uneconomical to soften water for use on the sanitary services and in swilling, and so forth. In the case of water softening by a public authority, no doubt there could be a saving to householders in that the provision of rain-water cisterns would be unnecessary. But we must bear in mind that the permanent water service would then be of one uniform type—there would be no choice for the user. If, on the other hand, a scheme could be devised whereby the water was softened one day—or one week—and not the next, then the householder, provided with storage tanks and stop taps, could get in a fresh supply of softened water for his bath and his washing, and the town would be saved half the cost of softening the whole of the town supply. It would be a somewhat difficult problem, perhaps, to pull all these public and private strings to the general satisfaction, but there is not general satisfaction by any means in the use of crude, hard-water supplies now. Of course, if individual householders themselves softened the water on their own premises, they might, by a system of duplicate service pipes, strictly assign the two waters to their respective best uses. The expense, we are afraid, would prevent many householders undertaking the work, and probably it would either be considered altogether too luxurious or too absurd. There are to-day, no doubt, a few folk who provide themselves with softened water "in parts" by a partial softening process, just as there are public authorities who provide inferior quality water for street watering or public baths. The cost of softening the whole of a town's hard-water supply would be cheaper, probably, than paying the outgoings, including interest and loan repayments, on a separate soft-water supply installation. And it is the question of cost that weighs chiefly with municipalities. Ideally, the two sets of water would be the better service for consumers, but the objections before noted weigh too heavily against the idea.

* * *

Highways in British Columbia.

The economic importance of a good system of highways in a country in course of development can hardly be over-estimated. The realisation of this fact by the Government of British

Columbia has resulted in considerable activity in recent years. Thus, since the year 1908, there have been constructed in that province no less than 7,000 miles of highways in addition to some 2,200 miles of "trail." These facts appear from a most interesting article specially contributed by Hon. Thomas Taylor, the Minister of Public Works, to our Toronto contemporary the *Contract Record*, and the successful achievement of so much work is specially creditable having regard to the unique character of the prevailing conditions. Thus, the immense territory to be opened up, and the widely-scattered population, coupled with the extreme variations in climatic and physical conditions, necessarily render the development of an adequate highway system both difficult and costly. It is perhaps specially worthy of note that highway engineers in British Columbia have been faced with problems arising from motor traffic similar to those which have confronted their *confrères* in this country. So acute, indeed, has the situation become that special legislation has had to be passed to govern the use of provincial highways by self-propelled vehicles. Such legislation, however necessary it may be as a temporary expedient, is essentially retrograde—a fact which is amply demonstrated by the history of highway administration in this country. The only way of progress is to adapt the roads to the traffic, rather than the traffic to the roads, and this is fully recognised by Mr. Taylor, who frankly acknowledges that traffic restrictions must ultimately have an adverse effect on rural districts, and points out that in a very short time British Columbia must face the problem of constructing a trunk road system at considerable expense capable of carrying a combined traffic of a heavy type. So thoroughly is this realised that at the present time very great thought and care are being given to the mapping out of what will ultimately be a great trunk road system for the whole province, and surveys and investigations in connection with the projected scheme are now in progress. The backbone of the scheme as outlined at present consists of a trunk road running generally north and south through the province, and another road or other roads running east and west. It is proposed to connect up these with the Great Pacific highway in the United States and the Transcontinental road of the Dominion of Canada. In connection with both of these undertakings the province has up to the present time set a splendid example to other countries by the extent and quality of the work that has been completed.

* * *

Dublin Corporation and Decayed Workers.

An idea, now almost obsolete, used to prevail that any kind of labourer—the lame, the aged, the halt, and (in many instances) the feeble-sighted—were quite good enough for road work. Many factors have contributed to the creation of other and better ideas on the subject of road making and road maintenance, and gradually we have witnessed the evolving of a system which, while not perfect by any means, is yet a great improvement upon that which it has displaced. The better order of things is making itself felt in Ireland, slowly perhaps, but with sureness, and for this we have to thank the seriousness and sense of responsibility which the municipal surveyors there have brought to the discharge of their duties. That Dublin should show the way in fixing a high standard of efficiency in so far as its road department is concerned would be quite in accordance with the fitness of things. That it does this may be doubted, if we are to judge from the terms of a report submitted recently to the Corporation Paving Committee by Mr. Norman Chance, the assistant engineer. After dealing with the financial aspect of the subject, Mr. Chance glances at the moral situation, and what he states is certainly rather striking. Premising that having regard to the very large amount spent on wages it is of the first importance that the wages staff should be efficient, he proceeds to call attention to the fact that among the men engaged are a large number no longer capable of heavy labour. Out of about 150 labourers, excluding those employed in the depots, it appears that "no less than forty-five men, or 30 per cent (on a conservative basis), are incapable of ordinary labour." How such a state of things should be permitted is not clear on the surface. It is obvious that the professional advisers of the Dublin Corporation are not responsible for it, and we can only surmise that it is part of some system of patronage appertaining to the members of the corporation. If so, it stands self-condemned, and should cease without delay. Even if these helpless and useless workmen have spent the better part of their lives in the service of the corporation, there can be no justification for their continuing to be members of a staff which is called upon for what is essentially active service. They ought to be relegated to the pension list, and, in justice to the department and those who are responsible for its administration, their places on the working staff should be filled by men who are efficient. Being a business concern, the paving department of the Dublin Corporation should be conducted upon business and commonsense lines.

* * *

Urban and Rural Housing.

In our last issue we were able to present to our readers a full report of the valuable contribution made by Mr. Reginald Brown, M.INST.C.E., to the recent discussion at the Surveyors' Institution on "Urban and Rural Housing." In his introductory remarks Mr. Brown called attention to the fact that much of the overcrowding and insanitation that exist are largely due to the occupiers themselves. We agree that this may be a factor in the situation, and that there is plenty of scope for sound educational work in domestic hygiene. Apart from this fact, however, it must be admitted that there is to-day a general shortage of accommodation both in town and country. Dealing with the remedies for this unfortunate state of affairs, Mr. Brown advocated equality of treatment between local authorities, public utility societies, and private builders in the matter of financial assistance. For this there is a good deal to be said, although we cannot here enter into an argument on this aspect of the question. Next, Mr. Brown suggested an increase in the period of the loans for buildings, roads and sewers to eighty years. This would have an undoubted effect in reducing rents, but it is open to question whether part of any reduction secured by this expedient would not be at the expense of the general ratepayer. We cordially agree that the crux of the problem lies in the difficulty of providing for the man with low wages and a large family, and Mr. Brown's suggestions in this connection are most interesting. He proposes that in letting houses preference should be given to those receiving the lowest wages and with the largest families; and that the National Exchequer should make grants to local authorities and others based on the number of children of non-earning age for whom accommodation is provided and actually utilised. To this scheme one school of politicians would probably object that it is in effect subsidising low wages, but Mr. Brown would no doubt prefer to regard it as a bounty given for the purpose of

encouraging a higher birthrate—a matter of national concern. Mr. Brown's contribution to the discussion was of peculiar value, inasmuch as it was based on a full knowledge of the facts.

* * *

The Royal Sanitary Institute.

Perhaps the most interesting part of the annual report of the Council of the Royal Sanitary Institute for 1914 is that which deals with the work accomplished in connection with the war. In the first place, the Institute has, by means of its examinations and equipment, been able to give medical attendance, at the request of headquarters, to many lectures and demonstrations to the officers and men of ambulance and sanitary companies. In this effort the council have had the co-operation of many well-known lecturers in these subjects, who readily gave their help, and devoted a large amount of time to the work, and the staff of the Institute, though reduced to half its usual number by reason of those who have enlisted in the Army, willingly undertook the extra work involved in the arrangements for these lectures. The lectures and demonstrations given up to the end of the year numbered over 100, with a total attendance of officers and men of 13,000.

In addition to this important educational work a willing response has been made to several requests by the military authorities that the Institute should make known the formation of new ambulance and sanitary companies. The publication of these requirements in the Journal brought them under the notice of the 4,500 members and associates throughout the Empire, and offers of enlistment were received by the Institute from all parts of Great Britain, and from India and Canada. At the present time no fewer than 200 members and associates are connected with the Army and Imperial Forces. The report also refers to the organisation of National Health Week, and states that prior to the outbreak of war over 100 towns and districts had under contemplation the observance of Health Week in some form. This showed very good progress as compared with previous years, but, in view of the prevailing circumstances, the committee after full consideration decided to postpone any general celebration until the conditions are more propitious.

* * *

Problems of Artificial Lighting.

The subject of artificial illumination has received considerable attention in recent years, and the consequent progress, both in theory and practice, has rendered possible the production of architectural effects which were formerly unattainable. The problem of artificial illumination as applied to buildings, which was discussed at the last meeting of the Society of Architects, ought not to be regarded entirely from the æsthetic point of view important as this may be. In addition, it must not be forgotten that another primary consideration is the optical comfort of the inmates. The discussion was opened by Mr. S. D. Chalmers, M.A., the head of the department of technical optics at the Northampton Institute, whose very instructive paper was avowedly limited to the relation of artificial illumination to architectural effects. He pointed out that the great contrast between the Classic and Gothic styles is closely associated with the variation of the lighting conditions, and, applying the same general principles to interior ornament, he argued that the more diffuse and less direct the lighting the more is it necessary to intensify the mouldings, carvings, and other relief. When the lighting comes from above in a comparatively narrow beam the ornament must be in low relief, while a general diffused lighting from in front is more suitable for cases of deeper relief. Particularly where rooms are to be used mainly by artificial light, the architectural features should be designed in relation to the actual method to be employed. For this and other purposes Mr. Chalmers concluded that there is room for development and the production of new and improved arrangements.

* * *

A Lesson in Tact.

One scientific man has devoted his attention to a particularly dead-alive subject, dealing with the subject of road repairs which appeared under the heading "Cycling Notes and News" in a recent issue of our contemporary the *People*. The writer begins by pointing out that road repairing and tarring operations will soon be in full swing, and proceeds to suggest that cyclists in each locality should wait upon the surveyor for the purpose of impressing on him "the necessity of doing the work in a systematic manner." He then refers to the pamphlets on road making and repairing which can be obtained from the Roads Improvement Association, and suggests by implication that these may usefully be employed as a species of tract for distribution among surveyors and road foremen. The last sentence must be quoted in full: "Many surveyors are willing enough to do the work properly, but, unfortunately, *they do not always know how*, and information upon the subject, *if tactfully given*, is often welcome." (The italics are ours.) A new terror will indeed be added to the existence of the surveyor if he is to be subjected to a continuous campaign of spiritual conversion or education at the hands of the cyclists of his district. Modern highway construction and maintenance is far too technical a matter for the mere amateur, and although the complaints of cyclists, as of every other class of road user, are entitled to the most careful consideration and attention, we venture to suggest that as a body they are not fitted to give instruction to surveyors in the rudiments of their business.

* * *

Water Waste.

Water engineers are familiar with the fact that, even with the most thorough precautions and the best possible system of inspection, it is not practicable to prevent a considerable amount of waste from taking place. Indeed, Mr. F. F. Longley, who has recently reported on the question to the St. John's, Newfoundland, municipality, estimates that the cities which have devoted most attention to the measurement of the water supplied, and having every service metered, are unable to account for from 15 to 30 per cent of the total flow. Mr. Longley was originally consulted owing to the fact that the municipal board found that the supply and pressure were apparently becoming inadequate. Calculation showed that the supply amounted to 166 gallons per day per head of the total population, or to no less than 300 gallons per day based upon the population actually connected with the distribution system. This, of course, showed either abnormal waste on the part of the consumers or the existence of some wholesale leakage. No appliances for measuring waste which would give the best results were available, but the methods of location devised by Mr. Longley met with considerable success, the general conclusion being arrived at that by far the greater part of the waste occurred in the house services. Hence the recommendation for a general installation of meters as rapidly as finances would permit, and the further suggestion that night inspection by sounding at the cocks should be repeated periodically.

Heavy Traffic Problems in London.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS DISCUSSION.

The heavy traffic problems of London were the subject of discussion at a Metropolitan District meeting of the Institution of Municipal and County Engineers held at 92 Victoria-street, Westminster, on Friday evening last. Mr. T. W. A. Hayward (Battersea), vice-president, occupied the chair, and there were present Prof. E. R. Matthews (University of London), Messrs. J. Birch (East Ham), W. Nisbet Blair (St. Pancras), P. G. Killick (Finsbury), Norman Scorgie (Hackney), E. F. Spurrell (Holborn), J. Sutcliffe (Deptford), E. Willis (Chiswick), O. E. Winter (Hampstead), and J. Williams (Hampstead).

Mr. Winter observed, in introduction, that we were now passing through what was nothing less than a revolution in traffic, and that one of the effects of the war, the increasing cost of horses and the improvements that were going on in mechanical vehicles, would be to hasten that revolution. In considering the questions to be dealt with by the Departmental Committee, they had to take a broad and comprehensive view. The transit of people and goods were vital considerations for London, and as engineers they did not want to place any unreasonable restrictions on mechanical transport. Undoubtedly their own experience showed them that it was, on the whole, a more economical method of traction, and not only that, but it had many highly important sanitary advantages over the old system of horse traction. He had with him a diagram showing the effect on the total cost of road maintenance in Hampstead since the introduction of heavy motor traffic—commencing with the year 1904. They would see from that that they had been able to reduce their total expenditure on highway maintenance and construction during the past three or four years. A high figure in 1912 was accounted for solely by the fact that motor omnibuses commenced to run on a new road which they were compelled to deal with at once. It was imperative that when such traffic went on to a road the use of ordinary macadam had to be discontinued immediately. He thought the diagram was very instructive. It referred not only to heavy-traffic roads, but to the whole of the roads in his district. He did not say that the diagram proved that the cost of their main roads had decreased; on the contrary, he thought the cost of maintenance of those roads had increased. On the other hand, there had been a saving in the cost of maintaining side roads which had been reconstructed on methods more adapted to motor traffic, in spite of the first cost. So it looked as if road costs were not going to be increased if the roads were reconstructed in a proper manner to meet the traffic. Therefore, as engineers, he thought they should not show any prejudice against heavy motor traffic, but rather encourage it as against horse traffic, not only for economical reasons, but on sanitary grounds. But there were certain restrictions and regulations which might reasonably be put forward in connection with heavy motors and traction engines. Heavy motors, he suggested, should be provided with wheels of larger diameter, and the tyres should be of rubber or other forms of resilient material. He thought that was especially desirable in London. In Hampstead the damage which the heavy traffic had caused to property as a result of the vibration had brought forth many complaints. He was inclined to think that the adoption of the bigger wheel would, with the rubber tyre, considerably reduce that trouble, and at the same time be more economical with regard to the effect on the roads, and, he ventured to submit, more economical as regarded the maintenance of the vehicles themselves. The next suggestion was that there should be a strict limit of weight on small wheels in any new regulations. There was no doubt the heavy weights carried on motors on small wheels had had a very destructive effect on their roads—on foundations, at any rate. In Hampstead 6 in. of concrete had been found quite inadequate. At the same time, he thought the heavy motor 'buses were the chief offenders in that respect. His view was that heavy vehicles with steel tyres should be restricted to a speed of 4 or 5 miles an hour. That would encourage the use of rubber tyres, which he thought was becoming one of their chief requirements in London. If traction engines were to be allowed in the London area he regarded it as a reasonable restriction that they should be provided with proper springs. The vibration these vehicles set up at present with the heavy loads they carried was no doubt a cause of great damage. He suggested that all projecting bars on the wheels of these vehicles should be removed and diagonal cuts substituted. As to contributions by owners of vehicles to the cost of road maintenance, as they knew, Middlesex last year obtained power to impose a charge per mile on motor omnibuses passing over the new Great West Road, and he thought it might be fairly arguable that special traffic like the London 'bus traffic should contribute some reasonable sum towards their roads. At present a tramcar contributed £203 per annum, and, it was estimated, a motor 'bus about £40. That seemed to him somewhat disproportionate and highly favourable to the motor 'bus. The 'bus was a popular means of conveyance, and they did not want to arrest its development in any way, but he thought it reasonable, having regard to the charges put upon its competitor, the tramcar, it should be made to contribute in a greater degree than it did at present. Even allowing for the larger carrying capacity of the tramcar, the motor 'bus was highly favoured as things stood. With regard to the question of the approval of routes by road authorities, it seemed to him the road authority ought to be consulted before a 'bus route was opened up. At present there was a great waste of public money because of the sudden adoption of a 'bus route on a road that was totally unfitted to carry such traffic, and in Hampstead they had had to spend hundreds of pounds in repairing roads damaged in that way. Then it sometimes happened that a road after having been put in a condition suitable for the heavy 'bus traffic was deserted for a more profitable route. The local authority was thus put to a quite unnecessary expenditure.

Prof. E. R. Matthews inquired whether the sudden increase in cost shown in the diagram exhibited by Mr. Winter was due to loan charges. [Mr. Winter: No.] Proceeding to refer to the vibration caused by motor-'bus traffic in London, the speaker suggested that it would be a great advantage if tests could be made as to the extent of that; it might prove of interest particularly to those members who gave evidence before the Departmental Committee. He could quite understand that owners of 'buses would take up the attitude that the conditions of to-day were different to what they had been in the past, and that the roads must be constructed so as to meet the altered conditions. If it were proposed to put forward proposals for a contribution by the companies it would be interesting to have a suggestion as to the basis on which that should be made.

Mr. E. Willis (Chiswick) observed that in the case of very heavy tractors the more driving wheels they had the less strain there was on the roads. In that connection he thought there was a future for the pedrail system, which lessened the tractive effort by as much as 300 per cent. In place of a wheel there were feet which came down with a universal joint something like an ankle joint, and these, instead of destroying, actually compressed the road. At Chiswick he had had the same experience as Mr. Winter in the matter of concrete foundations, and had found it necessary to replace 6-in. with 9-in. and 12-in. material. All trenches were now reinstated with 12 in. of concrete, which he found absolutely necessary in order to get a satisfactory surface. His view was that they must make their main roads free of any charges to motor 'buses and heavy locomotives; at the same time they ought to have power to regulate the traffic on other roads. If an authority could obtain a guarantee that motor-'bus traffic would continue to use a certain route for a long period they would then be willing to incur some expense. Frequently the 'buses went on to a road in which there were trees, and that promptly upset the whole character of the district owing to the pruning that became necessary.

Mr. E. F. Spurrell (Holborn) quoted figures showing how motor traffic had increased the cost of road maintenance in his borough. The heavy traction engines had even cracked some of the granite setts which they had put down in recent years.

Mr. W. Nisbet Blair (St. Pancras) stated that he also had had to take up 6-in. concrete foundations

under wood paving which had carried traffic for fifteen years without any damage occurring. A macadam road, he thought, with its appurtenances, was to be taken up in a completely new manner. They had to raise it all, and put in 12 in. of concrete. In other districts macadam roads had to be taken up to make room for tramway tracks along the centre; they simply could not keep the macadam on the roads. It was all "alive." He had found that the 9 in. by 4-in. setts which had since been adopted were split in the manner described by Mr. Spurrell. The motor lorries which were responsible for the damage carried coal, and they had also broken up portions of 3-in. by 6-in. sett paving. He attributed it to the steel-bound wheels and narrow tyres of these vehicles, and the speed at which they were run. They carried a nett loan of 10 tons, which was nearly all on the back wheels. Such traffic did undoubtedly crush the setts, and the damage occurred whatever form of grouting was adopted. The remedy was to make the surface as smooth as possible; the more they reduced the impact by substituting a rolling contact, so much would they reduce the damage. But he did not think the whole cost should fall upon the ratepayers of a district the roads of which had to bear a traffic that [illegible] with roads in other districts. With regard to 'bus traffic the central districts had to bear the heavier burden in maintenance, and he considered that the companies owning these vehicles should be called upon to make a contribution [illegible]. Parliament had always thought fit to impose on tramway systems. At present the companies paid rates on the property it occupied, but the districts through which the 'buses ran did not benefit. His view was that a reasonable basis for contribution should be on the 'bus mileage. He agreed that restrictions should be placed on the design of heavy vehicles, and that where these travelled at more than a walking pace the adoption of resilient tyres should be required.

Mr. NORMAN SCORER (Hackney) said it seemed to him that they had been paying too much attention to motor 'buses. When they considered that steam cars, road locomotives and traction engines paid nothing but their licence duties towards the upkeep of the roads, then he thought they had a grievance. But there was a danger in taxing these vehicles unduly, because whatever tax was put on them would not be borne by the owners, but would be handed down to the commodities they carried. Mr. Willis had spoken about the pruning of street trees. But the highways were not made for trees. Roads were a means of passage, and should be kept as open as possible. At the same time one class of vehicle should not be favoured as against another. He joined issue with Mr. Blair on the suggestion as to 'bus mileage being an equitable means of taxing. The City of London and the borough of Holborn probably had a greater 'bus mileage than any other district in the Metropolis, but he did not think the latter in its [illegible] areas did as much damage to the roads as they did in the outer fringe. The explanation of that was that the damage to the highways was caused by the pace at which the vehicles travelled. In those central areas the average speed was about 5 miles an hour; but it was very different in the outside districts, so he thought the 'bus mileage basis would be unfair. Mr. Brodie, of Liverpool, recently put the case in a nutshell when he said they had to endeavour to encourage the use of mechanically propelled vehicles for the purpose of transit, and that the fewer restrictions they put on it the better. They ought not, he said, to worry about the weights on them. He admitted that in Liverpool an odd sett or two was broken occasionally, but his policy had been to say nothing about it, but simply repair the damage. His (the speaker's) view was that Parliament would be very jealous of giving any other authority power to charge a rate per mile, and they had to remember that where it had been granted it only referred to vehicles plying for hire.

The meeting unanimously passed the following resolutions:—

(1) "That the damaging effect of heavy motor vehicles can be minimised by the use of wheels of large diameter, rubber or elastic tyres of a width properly adapted to the weight of the axle load, and suitable springs, and that all reasonable means of reducing the damage to roads caused by such vehicles should be enforced. (2) that heavy locomotives be fitted with proper springs, and that projections on the wheels be removed."

It was agreed that the resolutions should be brought to the notice of the council of the institution.

In the course of the meeting reported above the following were elected to form the Executive Committee of the Metropolitan District: Messrs. J. Rush Dixon (Woolwich), P. G. Killick (Finsbury), E. B. B. Newton (Paddington), J. Sutcliffe (Deptford), C. A. Hazeltine (Stepney), and E. W. Swinstead (St. Pancras). The two last named were elected as associate members, but we find on reference to the institution list that Mr. Swinstead belongs to the class of member.

HYDRATED LIME IN ROAD CONCRETE.

The State Roads Commission of Maryland, under the supervision of Mr. H. G. Shirley, chief engineer, is making some interesting experiments on the effect of about 10 per cent of hydrated lime mixed with the Portland cement used for concrete highway pavement. The first experiment (states *Engineering News*) was made in the summer of 1913 on a State road in Wicomico County. The proportions of hydrated lime to cement, by weight, varied from 10 per cent to 11 per cent.

The most noticeable effect of the hydrated lime on the wet mixture was increased plasticity. The ease with which the wet concrete slipped from the chute showed this. With a plain 1:2:4 mixture without the lime there was a tendency for the concrete to stick to the sides of the chute.

In reporting on the condition of the road in August, 1914, Mr. W. F. Childs, junr., resident engineer, stated that the sections in which the lime was used were apparently more homogeneous and dense. This condition was so discernible that he could readily pick out the sections in which the lime was used by observing the difference in the finish of the road surface. There was an apparent lack of laitance, and a uniform wearing of the surface. There were no signs of checks, or of transverse or longitudinal cracks. On adjacent sections, where lime was not used, there were transverse cracks. Apparently the hydrated lime had a tendency to reduce the effect of temperature changes, and thereby to prevent cracking.

In a report on a road built at Accident, in the fall of 1914, Mr. L. T. Downey, resident engineer, stated that it was found by experiment that with a medium wet mixture small cracks appeared in the pavement, but in a wetter mixture this was not noticeable. He attributed these cracks to the stone absorbing moisture. The addition of 10 per cent by weight of hydrated lime to the Portland cement seemed to give density to the mixture; the men on the strike board observed that it was harder to pull the board when lime was used. The lime gave the mixture a richer appearance, and it apparently retarded the setting somewhat. By December 8, 1914, cracks other than joints seemed to be fewer on sections where the lime was used than on other sections of the road.

Similar experiments have been made by the United States Office of Public Roads, and by the United States Bureau of Standards, upon the effect of hydrated lime in cement mortars.

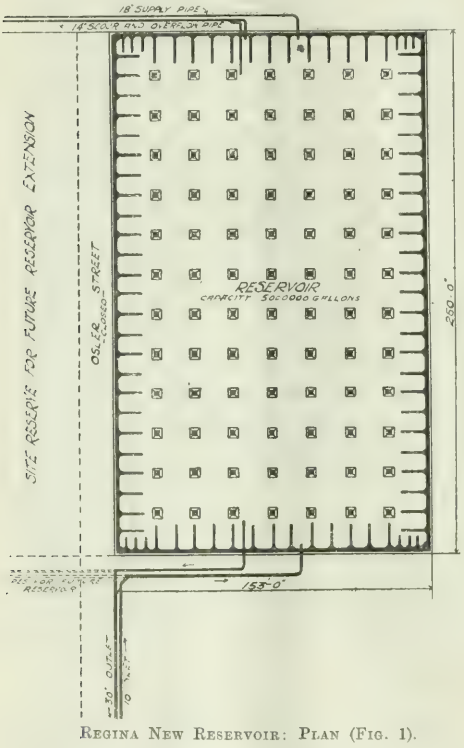
Trade Wastes Disposal Charges.—Ossett Town Council have confirmed a recommendation of the Sanitary Committee that for the disposal of trade refuse the following charges should be made in respect to the effluents of special trades: Fellmongers, 3d. per 1,000 gallons; tripedressers, 5d.; piggeries, 4d.; slaughterhouses, 3d.; collieries, 2d.; cab proprietors, tramways, railways, laundries, and mineral water manufacturers, 1½d.; gasworks, 3d.; leather curriers, 3d.; and coke washers, 2d.

Steam Roller Conversion for Traction Purposes.—In a report presented on Wednesday the Works Committee of Camberwell Borough Council stated that the borough engineer, Mr. W. Oxtoby, had reported to them that at the present time there was considerable difficulty in getting the number of men and horses required for the various services of the council, and especially for the cartage of material, and he had suggested that for traction purposes one of the council's steam rollers should be fitted with tractor wheels. Such wheels could be supplied and fitted at a cost of about £100 and it was believed that the cartage of material to the southern portion of the borough by the use of horse labour would be considerably reduced. The committee had therefore authorised the borough engineer to have tractor wheels fitted to the steam roller, with the necessary accessories.

The City Reservoir, Regina.

By R. O. WYNNE-ROBERTS, M.INST.C.E., M.CAN.SOC.C.E.

The part of Boggy Creek watershed from which the City of Regina, Saskatchewan, obtains its main supply of water is about 72 square miles in area, and the nearest point is about 6 miles distant as the crow flies or 8 miles by road. The watershed has a pear-shaped boundary, the narrowest and lowest point being at the south-west corner, where the city owns land. On this land about forty-five artesian wells have been sunk under the writer's advice. The water in all cases overflows the surface, and is collected and conveyed by underground pipes to Barton pump well, which has a capacity of 270,000 gallons In a pump-house adjacent to the well there are two 80-h.p. Crossley oil engines, and two 2,000,000 gallons per day



Regina New Reservoir: Plan (Fig. 1).

turbine pumps to raise the water to Tor Hill reservoir. This reservoir has a capacity of 5,000,000 gallons, is built of reinforced concrete, circular in plan, 202 ft. in diameter, 25 ft. deep, and stands about 90 ft. above the pumps and about 120 ft. above the city street level. The water is conveyed from this reservoir to the city by an 18-in. steel main, which has a maximum delivering capacity of about 3,500,000 gallons per diem.

In an adjoining section are located a number of springs yielding from 400,000 gallons upwards, according to the season. This constituted the only source of supply for the city until 1911, and was quite inadequate. This water is conveyed by 15-in. vitrified pipes to a basin half way to Regina, and thence by a cast-iron main partly 12 in., but principally 10 in., in diameter. The present total yield is from 2,500,000 to 3,000,000 gallons per day, but it is estimated that Boggy Creek area will yield up to 4,000,000 or 5,000,000 gallons per day by extending the collecting lines and sinking additional wells.

The 10-in. supply is pumped into the city mains by an electrically driven turbine pump, but the 18-in. ordinarily affords a gravity pressure of 45 lb. per square inch. When the demand is great and the pressure is diminished, then the water is pumped by a 5,000,000 gallons per day Escher Wyss turbine pump driven by a Bellis & Morcom high-speed steam engine.

ADDITIONAL SUPPLY.

The writer some time ago reported to the city council on the question of additional water supply, and recommended the adoption of a scheme which involved the taking of water from five watersheds contiguous to Boggy Creek, making a total area of about 200 square miles, and estimated to yield about 10,000,000 gallons per day. This scheme can be carried out piecemeal provided the initial works are properly laid out. A part of the scheme was a 27-in. steel main to tap the Silver Stream area, with a branch to Tor Hill reservoir. As the existing mains from Boggy Creek were delivering the maximum quantity on gravitation pressure system, it was deemed desirable to lay the part of the 27-in. main from Tor Hill reservoir to the city so as to supplement the quantity and pressure. The cost of the pipe line was estimated at about $508,000 [£101,600], which was a large amount to incur under the prevailing financial conditions. As a city reservoir would be necessary, even with such a main, City Works Commissioner Thornton considered that the reservoir would suffice for the time being. The supply to the reservoir is from the 10-in. line, and the night surplus from the 18-in. main.

Having considered all points of the scheme, it was decided to build the reservoir. There are two sites available—one near the cemetery, on which a duplicate of the Tor Hill circular reservoir could be constructed, and the other a piece of land near the power-house. Having regard to the convenience of a reservoir near to the power-house, and the obviation of the cost of laying a large main from the other site, the power-house site was selected. This land, however, was limited, and did not permit of embankments; consequently the writer designed a rectangular basin covering the entire site and part of a closed street, the length being 250 ft., width 153 ft., water depth 22 ft., and the capacity 5,000,000 gallons, which was estimated to cost about $125,000 [£25,000], exclusive of the land (see plan). Reservation was made for a duplicate reservoir to be built in the future.

GENERAL DESIGN OF NEW RESERVOIR.

The site was practically level, and, as it was advisable to assure a constant head on the turbine pumps, most of the reservoir had to be built above ground. The floor level is 6 ft. below the ground surface, and the top water line about 16 ft. above. The work will be described in the order of construction.

EXCAVATION.

It was intended to excavate the ground by machine, but to afford more employment it was done entirely by manual labour. The excavation extended about 1 ft. beyond the wall lines, and to an average depth of 7 ft. 4 in. The material was entirely gumbo clay.

FLOOR.

The floor, for a distance of 22 ft. inwards from the walls, is 20 in. thick; the central portion is 12 in. thick, and under each column 20 in. thick. The reinforcements consist of ¾-in. rounds at 12-in. centres in the lower part of the thicker concrete near the walls, and these bars extend 8 ft. up the walls to form the necessary tie; ½-in. round bars are also laid within 6 in. of the surface at 6-in. centres in two directions. These bars are tied with wire at every fifth intersection in one direction, and at every intersection in the other. The column bases have an extra layer of ½-in. bars at 12-in. centres in the lower portion. The concrete was laid to the level of the bars, and when these were placed the next portion of concrete was poured on, and finally a 2-in. finishing coat of fine concrete laid and trowelled to a close-textured surface. There is a fall of 1 ft. from one end to the other of the floor, and a small fall from the sides to the major axis.

WALLS AND COUNTERFORTS.

The walls are 33 in. thick at the base, with an addition of a splay on the inside of 36 in. There is a set-back on the outside of the wall at the ground surface, and here the concrete is 14 in. thick, and at the top 10 in. thick (see Fig. 2). The external faces are vertical, but on the inside there is a batter of 11 in. in a height of 23 ft. There is an overhanging

coping on top with a sloping surface to shed the water. The set-back and overhanging coping of 12 in. will be the base and finish respectively of a cellular tile wall, which will be explained further. The counterforts are 14 in. thick, and are located on the line of beams and intermediately, and their bases extend into the reservoir for 11 ft. 6 in., and finish at 9 in. above top water level, the projection there being 12 in. The counterforts at the corners are smaller to

thickness of the walls, and a uniform load equivalent to the varying depths of water. The horizontal reinforcements are round bars varying in diameter and spacing to correspond approximately to the area of steel required—at the base there are ¾-in. bars at 3½-in. centres, and at the top ⅝-in. bars at 4-in. centres (Fig. 2). These bars were cranked at the necessary distances and the ends bent. As it was too troublesome a work to change the cranking frequently, owing

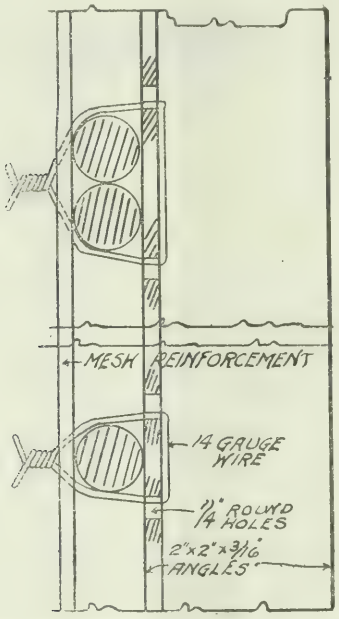
admit of circulation of the water. The extreme corners were filled in solid to avoid complicated form work, &c. At the connections of counterforts with the wall 6-in. splays are provided. Spaces were left in top of walls to receive beams, &c.

The reinforcements were calculated on the assumption that the walls between the counterforts were acting as simple beams, having depths equal to the

to the reduced thickness of the wall, the changes were made at six points. The counterforts were calculated as cantilevers hinged at the base of the wall, and tied to the floor at the toe, and are horizontally reinforced at the same spacing or multiples thereof as the wall, but the diameters are less. The tension bars connecting the toe to the floor consist of nine 1⅛-in. rounds linked round bars of the same diameter, inserted

crossways in the floor concrete. These bars extend upward for one-third the height; there the number is reduced to four, and from two-thirds height to top there are two ⅜-in. rounds. The overlaps are 2 ft., and the ends of bars all bent. The horizontal bars connecting the tension bar to the wall are bent into horizontal hooks to slip over the tension bar, and vertical bends to fall over the wall bars. There are ½-in. rounds at 12-in. centres vertically connecting the counterforts with the floor. To provide for temperature stresses continuous triangle steel-mesh reinforcements are inserted within about 3 in. of the outside face.

As it was most important that the horizontal wall reinforcements should be placed where designed and held there during the process of concreting, the writer adopted practically the same method as on Tor Hill reservoir. Vertical standards, consisting of 2-in. by 2-in. by $\frac{3}{16}$-in. angles, are located one at each buttress and two between. Two holes were drilled on one



Regina New Reservoir: Section showing Method of Fastening Horizontal Rods (Fig. 3).

web to receive each bar, and a soft wire was inserted through the two holes to bend the bar in place at the required distances apart (Fig. 3). This method fixed the bars permanently, and although men climbed up and down, no movement took place. The reinforcements and supports gave the impression of a secure steel basket work. All overlaps of wall reinforcements took place at junction of the counterforts with the wall.

COLUMNS.

The eighty-four columns are 18 ft. 9 in. apart in one direction, and 19 ft. ⅜ in. in the other, and are 16 in. square, resting on pyramidical bases, and the height from the top of the base to the underside of the beams is 21 ft. 9 in., or slightly over sixteen times the least dimension. It is somewhat difficult to assure true alignment and perpendicularity for a vertically cast column of this height, and to prevent any bending the reinforcement consisted of 2-in. by 2-in. by $\frac{3}{16}$-in. steel angles tied together by 1-in. by ⅛-in. flat iron riveted at 24-in. centres, which proved to be very satisfactory.

ROOF.

It was intended to construct the roof entirely of reinforced concrete to carry a live load of 200 lb. per square foot, and careful designs were prepared for this purpose, but, owing to a suspension of the work caused by financial disturbances due to the European political situation, much time was lost, and it was necessary to adopt a quicker method of construction. Consequently steel joists were substituted for the reinforced-concrete beams. The primary beams run across the reservoir, and the secondary beams lengthwise. The primary beams are 18 ft. 9 in. long, and rest on the columns, and the secondary are 19 ft. ⅜ in. less thickness of primary web and are secured together by standard angle connections. The secondary beams are 6 ft. 4 in. apart. The roof concrete floor is 5 in. thick, rests on the steel beams, and is reinforced with No. 31A continuous triangle steel mesh 54 in. wide, with overlaps of 4 in. Manhole covers at each end and four ventilators were inserted in the roof. The roof has a fall of 12 in. from the middle to the ends, and rain-water outlets are provided to carry off the surface water. The roof beams and concrete are disconnected from the walls by a thick layer of felt, so as to obviate any stress induced by temperature contraction or expansion being applied to the walls.

WATERPROOFING.

No waterproofing compound was used with the concrete, but when the walls were dry a thick layer of hot liquid bitumen was painted on, and this was afterwards coated with neat cement cream. This process was found to be effectual in the Tor Hill reservoir, and was again applied in this case. The roof will be coated in a similar manner.

CONCRETE MIXTURES.

The cement was supplied by the Canada Cement Company, and the gravel was obtained from the city gravel pits supplemented by some screened gravel from the neighbourhood. The pit gravel was tested before the work was started, and found to be fairly uniform. No screening was done. There are railway spur tracks at each end of the reservoir which were found to be very convenient, for the gravel was shovelled into the hopper, cement added, and the whole mixed by Ransome mixers. Five bags of cement per cubic yard of gravel were used in the floor, 6 bags in the walls, 8½ bags in the columns, 8 bags in the roof, and 6·3 bags per cubic yard in the floor finish.

DRAWINGS.

The drawings were so prepared that the nature of the reinforcements in every part of the work could be seen—that is, the position of the cranks, bends, overlaps, &c., were shown, and the number of bars, diameters, lengths, and weights were given. When the work was being carried out the cranked bars fell into their allotted places and then were fastened by wire. The work proceeded methodically from start to finish, and doubtless this contributed considerably to the economies effected, for there was very little loss of labour and materials.

PLACING CONCRETE.

As the concrete was mixed it was conveyed in ordinary two-wheel tipping concrete carts over runways erected from time to time in the most convenient positions. Men were employed in slicing the concrete in place, and care was taken to assure that the steel was properly covered.

DRAINS.

An 8-in. sewer pipe was laid outside the base of the walls to remove any water that may collect there, and to conduct the rain water to the sewer.

TILE FACING.

As the land occupied by the reservoir was limited and expensive, it was essential that the fullest possible use should be made of it. Consequently embankments had to be eliminated and the walls supported internally; hence the reason for using counterforts. Owing to the absence of external protection, such as would be obtained by embankments, steps were taken to insulate the wall against temperature in another manner. After due consideration, the method that was deemed expedient was the construction of an external cellular tile facing. Ties have been left on the outside of the concrete walls to bind the tile facing to it. The facing has been designed to produce a pleasing effect by providing pilasters and recessed panels. The winter arrived before this work could be undertaken, and consequently it was held over until the coming spring weather.

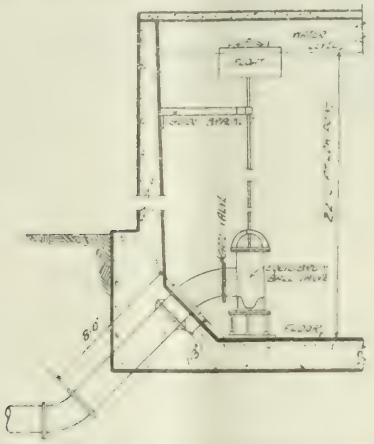
IRONWORK.

Inlets.—There are two inlets, one at each end, one 18-in. and one 10-in.; this is because of local conditions. Each inlet is provided with a sluice valve on the outside of the reservoir, and a Glenfield & Kennedy equilibrium ball valve which will control the height of water at any predetermined level. As previously mentioned, the 18-in. inlet will discharge the surplus night flow, and to assure the city a pressure, a Glenfield & Kennedy loaded equilibrium valve with by-pass has been inserted on this main, and so ad-

justed that no water will discharge into the reservoir until the main pressure has exceeded a fixed point. In other words, the equilibrium valve will act as a relief, and when the water level has reached a definite position, the ball valve will shut off the supply. (Fig. 4.)

Outlet.—There is one 30-in. bell-mouthed outlet at the upper end of the reservoir, and this is connected to the pumping plant in the power-house close by. All valves on this line are 24-in., with taper pipes at each end.

Overflow and Scour.—These are located at the lower end of the reservoir. The overflow pipe has a bell-mouth top, and is 22 ft. 6 in. above the floor at that point. It is secured to the wall by 4-in. by ¼-in. steel stays. The scour pipe also [illegible]



Regina New Reservoir: Elevation of 18-in. Outlet (Fig. 4).

Scale ½ in. to 1 ft.

situated in a sump 3 ft. deep. The overflow and scour run into one pipe outside the reservoir, where the valves are placed. (Fig. 5.) Additional valves are provided with chambers. Ladders are constructed of 4-in. by ½-in. steel stringers and ¾-in. rungs 15 in. apart and 18 in. long.

Puddle Rings.—All cast-iron pipes, bends, &c., inserted in the concrete work were provided with 6-in. by 1-in. puddle rings cast on with brackets, with the view to preventing water seeping along the pipework.

POWER-HOUSE CONNECTIONS.

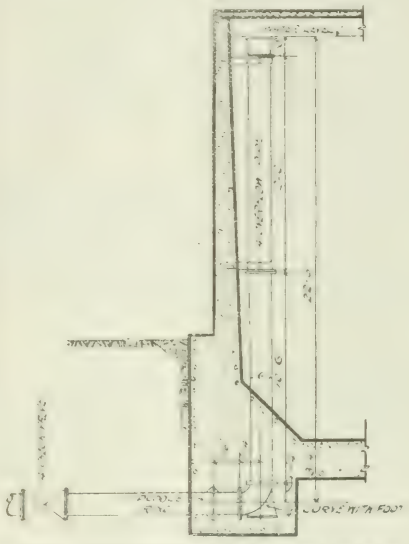
Inasmuch as it was important to provide adequately for fire extinction, the writer advised that the connections between this city reservoir and the pump should be made as large as possible, to suffice for some years, and in the interval the additional 27-in. main from Tor Hill reservoir, already referred to, would doubtless be constructed.

The basis of the calculation in connection with computing the quantity of water required for fire extinction purposes was the formula suggested by the American National Board of Fire Underwriters, which is—$Y = 850\sqrt{X}(1 - 0{\cdot}01\sqrt{X})$, in which Y represents imperial gallons per minute, and X represents the population in thousands.

The pipe arrangement at the power-house consists of one 36-in. supply main, fed by the 18-in. main from Tor Hill reservoir, and 30-in. pipe from the city reservoir, and one 36-in. delivery main; these are parallel and only a few feet apart. When the gravity supply and pressure from the 18-in. main is ample (supplemented by the 10-in. supply, which hitherto had to be pumped) the water passes direct into the 36-in. delivery main; otherwise all water is conducted to the supply main and pumped at city pressure into the 36-in. delivery main. There is an outlet from the 36-in. delivery leading into a warmed underground chamber under the footway, and there it is divided into three distributing mains, 24-in. to south-east district, 24-in. to south-west district, and an 18-in. to the north district. Each of these distributing mains is so arranged that the connections in the chamber will allow one, two, or three of the branches to be used simultaneously. On each branch there is a Glenfield & Kennedy pressure regulating valve, which can be adjusted to any pressure, and each main has a Simplex Venturi meter. The pressure-regulating valves are normally out of commission, but when a fire occurs in any district, two of the pressure regulators are put into action by simply opening small taps near the pump, and thus the fire pressure produced by the pumps is concentrated on the district from which the alarm was received. These regulators have lever arms carrying the weights which fix the outlet pressure, and the piston connected to the free end of the lever is operated by the outlet pressure, causing it to rise or fall, and in doing so an indicator in the power-house is moved correspondingly, and thus the operating engineer can see at a glance what is taking place.

Each Venturi meter is connected to the power-house by two wrought-iron pipes, which conduct the main pressure and the throat pressure to the recorder which indicates the rate of flow, records on a chart the varying flows, and also shows by a counter the total quantity discharged.

The credit for the neat and simple contrivance



Regina New Reservoir: Elevation of 18-in. Overflow Pipe (Fig. 5).

Scale ½ in. to 1 ft.

installed in connection with the regulator valves and Simplex Venturi meters is due to Mr. T. H. Smallwood.

FORMS.

The wall forms consisted of 1-in. by 8-in. sheeting, supported by 2-in. by 4-in. uprights at 24-in. centres, tied and strutted to forms on the opposite face by soft wire. The counterforts were formed in a similar manner, except that the sloping face had 2-in. by 8-in. and splays 2-in. by 10-in.

The runways were built of 6-in. by 6-in. verticals, 4-in. by 6-in. horizontals, and 2-in. by 12-in. surface boards.

COST.

As already stated, the estimated cost of the reservoir and connection was $125,000 [£25,000]; the reservoir alone was estimated to cost $110,000 [£22,000], and the connection the balance. The total actual cost of the reservoir was $78,514 [£15,703], and the pipe connections $14,951 [£2,990], making a total of $93,466 [£18,693], or $94,657 [£18,931], inclusive of sundry expenses, so that a saving of at least $30,343 [£6,069], which is equal to 23·2 per cent on the estimate, was effected by carrying out the work under the direct control of the waterworks department.

The city works commissioner (Mr. L. A. Thornton) took an active interest in the work, which was managed by Mr. J. M. MacKay, the waterworks superintendent. Mr. H. Gibson had charge of the execution of the work, and Mr. I. Ormond Riddell was the resident engineer, and Mr. Theo. Brockmann checked the design.

BUILDING REGULATION IN SHANGHAI.

By Charles H. Godfrey, M.Inst.C.E.,
Municipal Engineer.*

The past year constitutes a record in the local building trade, permits having been issued for the erection of 8,824 structures, of which 7,869 are Chinese houses, the greatest number of structures previously erected in any one year being 5,411 in 1906. Over 60 per cent of the houses erected have been built on undeveloped land, principally in the western district. Owing to the unprecedented boom in the building trade a very large number of "mushroom" contractors have made their appearance, many of whom have previously been clerks or small "jobbing" contractors, and consequently without practical experience, usually relying upon guesswork or the doubtful ability of a foreman to work out their estimates, which in many cases are cut so low that it is impossible to properly carry out the work without serious loss, unless very inferior materials and cheap labour are employed. The energies of the building inspection staff have been directed to counteract this as far as possible—an attention which is frequently misunderstood. The inspectors, in addition to undertaking the duties of clerks of works, are, on occasions, called upon by the building owners to bring pressure to bear on the contractor to enforce the proper execution of work, and in more than one instance a request has been made to the department for a report upon the quality of the work done before further payment on account is made to the contractor.

It is worthy of note that the hostile attitude of the local Chinese towards the amended building rules, which were framed with the object of decreasing the number of nesting-places for rats in Chinese houses, has almost disappeared, and in a great number of cases it has not been difficult to persuade building owners to also omit the ceilings—always a favourite run for rats—to the ground-floor rooms, although the "ratproofing" by-laws do not call for this to be enforced.

There is still a growing tendency to embody features of a foreign-style house in those of Chinese construction, chiefly in the dividing up of the hongs and better-class houses into small rooms with open fire-places, and the introduction of very ornate wooden panelling and cornice moulds; the old-fashioned dignified interior of a first-class Chinese house is now very rarely met with in those of modern design. If this transitional state develops much further, radical changes will have to be made in the building rules to ensure the stability of the ordinary Chinese dwelling-house.

JERRY-BUILDING.

Formerly it was the universal custom to employ not less than five upright Foochow poles, carried to the roof, filled in between with 3-in. bricks, to divide each house of an approximate width of 12 ft. At first two poles were omitted, but at present very often only two upright posts—one at either end of the division wall—are used, with the result that the division or partition wall is considerably weakened, and also—what is more to the point to the speculative builder—the cost per house is greatly reduced. A large proportion of the jerry-building which is met with is on leased land; the lessee, naturally, perhaps (knowing that the houses which he is building will revert to the lessor at the expiry of his lease), puts up the cheapest class of property permissible under the building rules, caring little for the comfort or safety of the tenants, so long as he is able to get as large a return as possible on his outlay.

The present extraordinary activity in the building trade has shown more clearly than ever the great necessity for new building rules of a far more stringent character than has hitherto been considered necessary. It is evident from the examination of many of the old buildings, both foreign and Chinese, that the standard of workmanship has been very much lowered of late years, and as the settlement increases it is only reasonable to assume that unless checked it will sink still lower, particularly if the seemingly popular system of leasing land for a number of years to speculative Chinese builders continues. The need for by-laws governing the erection of Chinese theatres, cinema halls, hotels, Chinese lodging-houses, and similar buildings used by the public is very urgent, the more so because the number of "Chinese architects" without experience in design or construction is rapidly increasing, and although the council has the power to refuse to license any such building unless provided with adequate means of exit for the escape of the inmates in case of fire, the applicant for a permit to erect a building frequently feels, upon being requested materially to amend his plans, that he is being harshly dealt with. A very great deal of unnecessary labour and vexation to both the architect, the building owner and the public works department might easily be avoided if, in cases where the building owner is doubtful as to the conditions under which a licence will be granted, sketch plans of the proposed building were first submitted to the council for suggestions with regard to exits and other important details instead of, as would seem to be the custom, first preparing finished drawings, obtaining estimates, and, in many cases, actually settling the contract before applying for a permit.

The increasing use of reinforced concrete in the construction of many large buildings forms a new era in the local building trade, and in the interest of property owners and the public generally, by-laws regulating the construction of this particular class of building need to be introduced and rigidly enforced. The absolute necessity for expert supervision is apt to be overlooked, and that, together with the inexperience and carelessness of the average Chinese labourer, constitutes a grave danger, as, although the design as approved may be correct, when once the rods employed in the construction are covered it is almost impossible to detect bad work until unexpected cracks or more serious defects make their appearance.

* Extract from annual report

FIRE PROTECTION AT CHISWICK.

The equipment and *personnel* of the Chiswick Fire Brigade are the subject of a short but interesting report just issued by Mr. Edward Willis, the engineer and surveyor to the urban district council. The brigade is composed principally of volunteers.

Including sixty-three fixed by the Metropolitan Water Board, there are available for use in the district for fire-extinction purposes 412 hydrants. This, Mr. Willis points out, is equal to three per acre, or ten per 1,000 of population—a number which, he thinks, will compare with the majority of urban districts throughout the country, considering their favourable position in relation to the area covered with buildings.

An extension of fire alarms is looked for now that the council have decided on the employment of a permanent fireman electrician.

Attention is drawn in the report to the fact that a number of spans of wire communicating with the station are unduly long. Dealing with this point Mr. Willis says: "The principle of numerous wayleaves is not one to be advocated, as the tendency of owners is, not unnaturally, to attribute any defects in the watertightness of their roofs to damage caused by the contractor or the council's servants in repairing or maintaining the overhead wires, and I would again emphasise the advisability of gradually lessening the long spans and substituting overhead pole lines or underground wires with a view to greater efficiency and ultimate economy, with a corresponding reduction in complaints."

Owing to the fire engine being a horse-drawn appliance £136 yearly is spent on the hire of horses. It appears that the motor fire escape in the possession of the brigade usually reaches the scene of a fire first, and the surveyor looks forward to the time when a motor fire engine will be provided. He estimates that this, in addition to adding to the efficiency of the department, would result in a saving of at least £100 per annum. At the same time he suggests the purchase of a motor engine carrying a light fire escape and chemical engine, or a modified first-aid apparatus attached to the motor pump.

Boston Electric Lighting.—The Boston Town Council have this week received an intimation from the Board of Trade that the Provisional Order for the supply of electricity to Boston and district has been granted.

Lincoln Corporation Bill.—The Lincoln Corporation Bill, which is now being considered by the Local Legislation Committee of the House of Commons, seeks power to acquire and extinguish the rights of the freemen and others in respect to the commons; to run trolley vehicles and motor omnibuses; to make further provision with regard to the supply of gas and electricity; and with regard to the health, local government, and improvement of the city.

REPLANNING AND REDEVELOPMENT IN EXISTING AREAS.

IMPROVEMENTS IN THE LARGER CENTRES.

In his recent paper to the Town Planning Institute on the subject of the replanning and redevelopment of existing areas—some extracts of which appeared in our issue of the 23rd ult.—Mr. W. T. Lancashire, M.INST.C.E., the city engineer of Leeds, furnished some interesting particulars of the work done in a number of large towns. The information in question, which was supplied by the engineers of the several municipalities, and which formed an appendix to Mr. Lancashire's paper, is reproduced below:—

Town.	Assessable value	Amount produced by penny rate.	Cost of street widenings and improvements during last 20 years.	Replanning of built-up areas other than those necessitated by street widenings.
Birmingham ...	£4,853,184 (estd. 1915).	£16,500	Nearly £1m. has been spent on the purchase of property in the past 14 years.	One scheme in respect of a crowded and insanitary area in centre of city was carried out under the Artisans' and Labourers' Dwellings Act. Area 4½ acres. Cost £1,700,000. A scheme under Part 1, Housing of Working Classes Act, 1890, has been carried out at a cost of £16,100.
Bradford ...	£1,100,472	£5,940	£2,250,671	Replanning portion of city known as "central area" projected at the present time by reason of railway company's extension through the centre of the city. Area 10a. 3r. 7½p. Estd. cost approx. £800,000. Amount spent on schemes under Part 1, Housing of Working Classes Act, 1890=£44,500. Estimated cost of proposed schemes, £21,000.
Bristol ...	Borough rate, £1,785,068. District rate, £1,768,854.	£7,100	Approx. £1,000,000.	None.
Hull ...	£1,370,227	£5,458	Improvements referred to in next column with main road widenings cost approx. £125,000.	Central area was practically remodelled between 1896 and 1908. Proposed scheme under Part 1, Housing of Working Classes Act, 1890, laying out and providing workmen's dwellings in condemned area of 21,000 square yards. Estimated cost £107,270.
Leeds ...	£2,225,[illegible] (City rate).	£9,200	About £2,500,000.	Two unhealthy areas (66½ acres), cost to date about £853,150, including purchase of properties and part of cost of re construction. Sovereign-street area (8 acres), clearing congested area, filling up offensive goits and replanning. Infirmary area, joint Infirmary Board and Corporation scheme (8 acres), demolition of slum, infirmary extensions and relaying out.
Leicester	£1,[illegible]	£4,096	—	None.
Liverpool ...	Poor rate purposes, £4,[illegible]. General rate, £4[illegible].	£15,800	£5,000,000.	Various small areas rearranged and rebuilt for dispossessed tenants. 19,230 court houses have been demolished since 1864. Actual cost £1,162,465. Deficit chargeable on rates about £[illegible] net cost.
Manchester ...	£[illegible]	£18,245	Upwards of £[illegible] since 1868.	Several schemes have been carried out under Housing of Working Classes Act, 1890, Parts 1 and 2.
Newcastle-upon-Tyne ...	£1,712,[illegible]	£6,841		None.
Nottingham ...	£1,[illegible]	£4,080		Now clearing a "slum" area, laying out same with widened streets and building on a portion of site houses for accommodation of people disturbed. Area 7¼ acres. Estd. net cost £132,000.
Sheffield ...	£1,[illegible]	£7,677 approx.	Approx. £2,[illegible] during last 25 years.	Clearance of an "insanitary area"—*i.e.*, demolition of old and insanitary property and building thereon flats, &c. Area 23,908 square yards. Cost to date about £150,000. No further schemes are contemplated.

Liverpool. Cost of construction of new wide streets through unbuilt land averages £10,000 per mile.

Cost of construction of new wide streets through built-up areas on outskirts, £80,000 per mile.

Cost of construction of new wide streets immediately outside central area, £400,000 per mile.

In answer to the following enquiry: "Have you any general plan of contemplated street widenings or improvements in or about the centre of the city, or do you deal with them in detail as occasion necessitates?" none of the above towns appears to have a general plan of this nature. Special Parliamentary powers are obtained from time to time.

Dangers in the Use of Paint.—The Departmental Committee which has investigated the dangers attendant on the use of paints of which lead is a part issued their report on Wednesday. They recommend that a law should be introduced prohibiting in this country the importation, sale or use of any paint material which contains more than 5 per cent of its dried weight of a soluble lead compound, with necessary exemptions for certain special classes of colours, such as those used by artists. To permit adequate time for the arrangement of supplies of non-poisonous material, the committee recommend that the restrictive legislation be not brought into force until three years after the date of their report.

KILLED IN ACTION.

BIRMINGHAM OFFICIAL'S DEATH AT THE FRONT.

Captain Fountain O. C. Nash, of the 5th Battalion (Territorials) of the Northumberland Fusiliers, chief town planning assistant in the Birmingham city surveyor's department, has been killed in action, we regret to state. The news was made known at the council house on Friday last, we learn from the *Birmingham Post*, and it was received with regret, for during the time Mr. Nash had lived in Birmingham he had gained the respect and esteem of all.

Mr. Nash was the son of an artist and the grandson of the author of the "Famous Homes of England." He was for some years engaged as assistant in the Rochdale Borough surveyor's department, and afterwards became surveyor of Cockermouth, a post which he relinquished on obtaining an appointment at Newcastle-on-Tyne. In November, 1913, he was appointed chief town planning assistant in the department of the Birmingham city surveyor. He was a smart and able official, and made a good impression in the town planning department, where his ability as a surveyor and architect was speedily recognised by the Town Planning Committee and all who were associated with the development of the schemes of town planning. When the war broke out he was called up to his regiment, for he had been actively identified with the 5th Battalion (Territorials) of the Northumberland Fusiliers for some few years, and he went with his battalion on active service as a captain. Captain Nash had always taken great interest in military work, and had qualified in musketry and in various other subjects, and he had also passed the School of Instruction for rank of field officer. Captain Nash, who lived at Moseley, and was about thirty-four years of age, leaves a widow and two children.

Society of Architects.—A meeting of this body will be held on Thursday next at 28 Bedford-square, W.C., to consider a draft of the proposed model general conditions of contract to be recommended by the society for use in connection with building works. The chair will be taken at 7.30 p.m.

SOME RECENT PUBLICATIONS.*

Heating and Ventilating Buildings. Sixth edition, revised and rewritten. By R. C. Carpenter, M.S., C.E., &c. Price 15s. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited.

The first edition of this manual for heating engineers and architects was published twenty years ago, and its popularity is evidenced by the fact that since that time five complete editions have been printed and sold. The importance of the subject has been increasingly recognised in recent years, which have consequently witnessed considerable scientific development. The present edition has therefore been thoroughly revised and largely rewritten so as to bring it up to date. The author summarises the purpose of the book as being to present, in as clear and concise a manner as possible, first, a statement of the general principles of pure science which apply; second, a discussion of data and results of important investigations for showing the application of rational principles to practical construction; third, the various practical methods employed in heating and ventilating buildings; fourth, the methods of designing various systems of heating and ventilating; and, fifth, a collection of useful tables for practical application of the principles stated. These objects have been well achieved, and the result is a practical treatise which can be confidently recommended to those interested in the important topics dealt with.

Surveying and Levelling Instruments. By W. F. Stanley. Fourth edition revised by H. T. Tallack. Price 7s. 6d. London: E. & F. N. Spon, Limited.

The vast and unique experience of the late William Ford Stanley in the design and construction of surveying instruments was sufficient to insure the success of the first edition of this book, which appeared in 1890. Subsequent editions contained various improvements, and the new edition has been thoroughly revised by Mr. Tallack, who actively co-operated with Mr. Stanley in bringing many of the instruments described to their present state of perfection. In no other work, so far as we are aware, is the subject dealt with on so comprehensive a scale. The descriptions of the several instruments are both theoretical and practical, while the technical principles are made clear by illustrations of such parts of important instruments as cannot be seen from the engravings of the instruments as a whole. The work is both complete and authoritative.

The Panama Canal. By R. E. Bakenhus, S.B., H. S. Knapp, and E. R. Johnson, PH.D., SC.D. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited.

This work deals with the history and construction of the Panama Canal, and also with its relation to the Navy, international law, and commerce. The book is divided into six parts, the several titles being: Historical; The Route—the design and construction; Sanitation; Costs of Work Elements of Success; Conclusion; the Navy and the Panama Canal; the Panama Canal in International Law; and Commercial Importance of the Panama Canal. The several articles comprised in the book were originally published in the "Proceedings" of the United States Naval Institute. They are now revised and consolidated into a single work, which, without going into unimportant detail, enables the reader to obtain some grasp of the meaning of this enormous enterprise.

The Design of Steam Boilers and Pressure Vessels. By G. B. Haven and G. W. Swett. Price 12s. 6d. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited.

In this book the authors, who are professors of machine design at the Massachusetts Institute of Technology, give a connected account of the principles of boiler design. The work is designed, as far as possible, to further the use of rational methods, and to this end the use of empirical rules has been avoided, except where absolutely necessary. The first three chapters are devoted to the elucidation of principles and formulæ, which are applied in the later part of the book to the practical design of various types of boilers and pressure vessels. The book is one which should be appreciated by the specialist in this class of work.

Spons' Architects' and Builders' Pocket Price-book for 1915. Edited by C. Young and S. M. Brooks, FF.R.I.B.A. Price 2s. 6d. nett. London: E. & F. N. Spon, Limited.

As a price-book which is really suitable for carrying in the pocket, this work will be found very useful. The present is the forty-second edition, and contains much new matter. In addition, all the prices have been revised, while the section dealing with the hire of builders' plant has been entirely recast. It is pointed out in the preface that, in consequence of the war, markets vary considerably from week to week, but the prices given are in accordance with the cost of material at the time of going to press. The editors appear to have succeeded once more in producing a thoroughly useful, practical and reliable price-book.

Air, Water and Food. By A. G. Woodman and J. F. Norton. Fourth edition, revised and rewritten. Price 8s. 6d. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited.

In this book the authors deal with the subject "from a sanitary standpoint"—that is, from the point of view of hygiene. The work is principally concerned with analyses for the detection of impurities and adulteration. It has been carefully revised so as to incorporate recent advances in analytical methods.

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

Irvine Water Supply.—An enquiry has been held at Glasgow under the Private Legislation Procedure (Scotland) Act in connection with the Provisional Order promoted by the Irvine and District Water Board for the purpose of extending their reservoir accommodation at Knockendon and filtering works at Greenhead.

Sewers Damaged by Trade Wastes.—A discussion took place at a recent meeting of the Upper Stour Valley Main Sewerage Board regarding the alleged liability of Halesowen Rural Council for damage to a sewer at Belle Vale, Halesowen. The board alleged that the damage was caused by tipping over the land. The rural council denied liability. It was decided to appoint a sub-committee to confer with the Halesowen Council upon the matter.—It was reported that manufacturers' waste fluid was having a damaging effect upon the sewers in certain districts, and the engineer was directed to make enquiries.

Irish Housing Schemes.—On Saturday last, in the House of Commons the Chief Secretary for Ireland was asked if it would take the three Local Government Board inspectors appointed for the purpose of holding local inquiries respecting housing schemes under the Labourers (Ireland) Acts lodged with the Local Government Board two years to complete their work; and, if so, whether he would consider the advisability of appointing additional inspectors to hurry the work through and enable the schemes to be completed without further delay. Mr. Birrell stated that at the present moment the Local Government Board were in correspondence with the Treasury on the subject of the limitations to be placed on the funds required for pending schemes, but it was certainly not in contemplation in the existing circumstances to appoint additional inspectors for the purpose mentioned.

Cost of Cottage Building in Ireland.—In the House of Commons on Saturday last the Chief Secretary to the Lord Lieutenant of Ireland was asked whether the Local Government Board for Ireland would grant supplemental loans to rural district councils to meet the extra cost per cottage caused by the councils being compelled, owing to the rise in the price of building material and the difficulty of securing contractors for the work, to pay more per cottage than the maximum sum at present allowed; and whether the Board, in view of the difficulty experienced by councils in getting contractors to carry out the work, would consider the advisability of increasing the maximum amount allowed per cottage. Mr. Birrell said the practice of the Local Government Board had been when the cost of a cottage exceeded the loan sanctioned out of land purchase funds, to permit the local authority to obtain a supplemental loan in the open market, and this practice might still be pursued in particular cases. The board, however, were not prepared at this juncture to alter their settled policy of limiting the amount of the advance out of land purchase funds for each cottage and plot.

The Surveyor
And Municipal and County Engineer.

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CORRESPONDENCE.

(One main does not necessarily agree with correspondents.—EDITOR.)

PREVENTION OF CORROSION.

To the Editor of THE SURVEYOR.

SIR,—I note it is stated in your report of the paper presented by Mr. W. H. J. Binnie, M.INST.C.E., F.G.S., on the "Corrosion of Iron and Steel," read before the Institute of Sanitary Engineers, that the treatment of pipes with bitumen or hessian and bituminised stockinette prevents corrosion.

All the materials, however, I have met with up to the present have been practically mixtures of tar and pitch, and I would be very glad to hear of a case where bitumen pure and simple has been used, and what was the origin of the bitumen in question.

I quite agree that genuine bitumen, without the admixture of tar, &c., is the finest known preservative, but unfortunately it has not been used as far as I know, without adulteration, and bitumen, therefore, merely named, has not had a full opportunity of showing what it is capable of.—Yours, &c.,

FOUNDER.

May 1, 1915.

Town Planning at Colne. The Local Government Board have given authority to the Corporation of Colne to prepare a town planning scheme in respect of an area of about 836 acres in the borough.

Parliament-square Wood Paving. In the House of Commons on Saturday last Mr. Booth asked the hon. Member for Saffron Walden, as representing the First Commissioner of Works, whether the contract for wood pavement in front of the Houses of Parliament was placed with a condition that the work should be completed during the Easter Recess; and whether competitive tenders were withdrawn because, in the opinion of the firms concerned, it was impossible to finish the work in the specified time? Mr. Beck stated, in reply, that tenders were invited from five firms, of whom four sent in an offer; the lowest was accepted. There was no condition that the work should be completed during the Easter Recess, and therefore the point raised in the latter part of the question did not arise.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is it not curious that the breaking strain of red tape is beyond the most learned mathematician's calculation? Is not the action of the Local Government Board with regard to the urban district councils of Malden and Coombe, and their refusal to allow them to pay the cost of a small rifle range an example of this strength?

* * * *

Is it not strange that, whereas on the one hand we hear of the excessive difficulty experienced in procuring land for the purpose of erecting workmen's dwellings owing to the price demanded by the owners we also hear the all sides complaints of owners of land as to the depreciation of the value of their property which has lately occurred? What has the great National Land Valuation scheme done to solve this anomaly?

* * * *

Is not the city surveyor of Manchester to be congratulated on the fact that out of 154 members of his staff, no fewer than fifty-two have joined the Army since the outbreak of the war? Is it not evident that if this splendid spirit animated the majority of the able-bodied men in this country the period of the war would be considerably shortened? Are there not even now far too many men in this country still doing work which could be equally well performed by women?

* * * *

Would it not be somewhat enlightening if we could have an expression of opinion on the somewhat vexed question as to whether tarred gaskin is really necessary in a [illegible] for sewerage? Do we not find that, whereas one set of sanitary engineers contend that it is essential, another set say that they would not have it at any price? What is the truth as to the expediency of using it?

* * * *

Has not the correspondence in THE SURVEYOR with regard to the last report of the Royal Commission on Sewage Disposal been of considerable value? Is it not evident that nearly everyone is agreed that "the last word" has not yet been said upon the problem of the best way to treat sewage for purposes of purification? Is it not to be hoped that the Local Government Board will embark on some research work in this direction, if they can spare the time from town planning?

* * * *

Is it a fact that, for the past forty years or more, every school that has been erected in Germany has been so designed that it can at any time be converted, at very small cost, into a military hospital? Will our school authorities in this country take a lesson in "Kultur" from the Huns, who seem to have had a wonderful conception of what they were preparing for many years before putting it into operation?

A District Council's Protest.—At the annual meeting of Stourport Urban District Council it was decided to write to the Worcestershire County Council protesting against the delay in paying the amount due for maintenance of the main roads. The clerk said the final payment for the year ended March, 1914, was not made till a year after it was due. It was also decided to protest against a reduction made on the amount claimed by the council.

Lower Thames Valley District Surveyors' Association. The Lower Thames Valley District Surveyors' Association held their last meeting of this session on April 24th, a visit being made to Surbiton, where a pleasant and instructive afternoon was spent in inspecting the sewage disposal works and destructor. Tea was provided by Mr. H. T. Mather, the surveyor to the urban district council. At the evening meeting, Mr. J. W. Croxford, the president, in the chair, a discussion on the works visited during the afternoon took place, the consensus of opinion being that the results attained by Mr. Mather were highly satisfactory. The annual dinner of the association, owing to the war, is not being held this year. During the summer the association hope to make visits of inspection to works in progress and completed.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Little Hulton U.D.C. (April 29th. Mr. Raymond Unwin.)—This was an inquiry into an application for authority to prepare a town planning scheme for the district. The clerk, Mr. J. H. Heys, stated that the council had several times had under consideration the advisability of preparing a scheme in accordance with the Town Planning Procedure Regulations Act, and in August, 1913, notice was given of their intention to apply for powers. Most of the land in Little Hulton was built on in strips, the districts most affected being Manchester-road West, Cheggs-lane, and Worsley-road, and future building would have to take place off the high roads. They had had an informal conference, when the owners of property or land were given an opportunity to object to the scheme, but no opposition was offered. That being so, it was felt that the council could not do better than proceed on town planning lines. They were not very well served with roads on the east and west, but they could not complain about those on the north and south sides. Their building by-laws had been in force from 1887, but were reviewed in 1906 or 1901, and brought up to date. It was stated that details would be considered later.

Newport (Mon.) T.C. (May 4th. Mr. P. M. Crosthwaite).—£14,820 for drainage works in the Corporation-road district, and £765 for the purpose of raising the eastern bank of the river Usk from 30 ft. to 32 ft. fronting certain works.—The deputy town clerk (Mr. Treharne Morgan) stated that the new drain had become necessary because the Mannesmann Tube Company had taken a large area of land upon which to build large works, where something like 3,000 men would be employed. The offices had been built, and, though the works were not now being built, the corporation had been informed by the engineer to the company that some portion of the works would be completed this year. One of the conditions of the works coming to Newport was the construction of this drain, and the corporation had entered into an agreement to supply it. The corporation wanted to be in a position to proceed with the work at once. The inspector remarked that it was difficult to get sanction for loans just now. The deputy town clerk replied that the corporation wished to be able to go on with the work as soon as convenient.

APPLICATIONS FOR LOANS.

Belfast R.D.C. - £250 for works of sewerage.

Cornwall C.C. £728 for the enlargement of the laundry at Truro asylum.

Fyvie School Board. £1,000 for the rebuilding of Woodhead school.

Oswestry R.D.C.—£350 for water supply extensions.

Rathdrum R.D.C.—£1,400 for the Kilpedder sewerage scheme.

Rothwell U.D.C. £7,300 for the Lemonroyd sewage disposal scheme.

Southampton T.C.—£14,000 for building a water tower.

LOANS SANCTIONED.

Haslingden T.C. £4,600 for electricity mains, and £2,770 for transformers, switch gear, and services.

Leeds T.C. £158,356 for the electricity undertaking, and £40,000 for the gas undertaking.

Liverpool T.C. £24,500 for a small pox hospital.

Middlesbrough T.C.—£4,600 for the improvement of Auckland-road.

Newry Port Sanitary Authority.—£500 for an isolation hospital.

Swansea T.C.—£3,100 for the purchase of land for hospital extension.

Walton-on-the-Naze U.D.C.—£500 for sea defence works.

FORTHCOMING INQUIRIES.

MAY.	£
10.—**Chadderton.** For works of sewerage (Mr. R. H. Bicknell)	1,495
10.—**Langport.** For works of water supply (Mr. W. O. E. Meade-King)	
10.—**Normanton.** For the erection of workmen's houses (Mr. Courtenay Clifton)	1,400
11.—**Brampton.** For works of water supply (Mr. A. G. Drury)	3,600
11.—**Folkestone.** For works of sewerage (Mr. P. M. Crosthwaite)	1,000
11.—**Lymm.** For works of sewage disposal (Mr. R. H. Bicknell)	300
11. **Milnrow.** For works of sewerage (Mr. F. H. Tulloch)	1,000
12. **Ambleside.** For works of sewage disposal (Mr. A. G. Drury)	922
12.—**Hythe.** For works of sea defence (Mr. P. M. Crosthwaite)	1,590
13.—**Gannock.** For the erection of working-class houses (Mr. Courtenay Clifton)	10,675
13.—**Manchester.** For works of sewerage (Mr. A. G. Drury)	9,060
14.—**Tamworth.** For works of sewage disposal (Mr. A. G. Drury)	2,200

THE LOW COST ROAD.*

By Philip P. Sharples.
New York.

It is a great mistake, economically, to choose a type of road that is better than we need for the purpose. It is a little hard to illustrate this point without going to extremes. In New England temporary roads are built for hauling logs out of the woods in winter time, and perhaps the road will only be used one winter. Naturally not much money can be spent on it. On the other end of the scale let us take the main street of a very large city—say the approach to the Brooklyn Bridge in New York City. That thoroughfare receives, perhaps, more travel than any other in the United States, and it would be economy to build the very best type of pavement regardless of cost. These are the two ends of the problem, and any local engineer must choose a road somewhere between those two types.

In this country [the United States] you must choose the low types very often, but it pays to put in the best of the type and to provide for excellent maintenance. It is a great mistake to neglect the low-cost road; it often leads to extravagance in the community. I have seen districts where high-cost roads have been built just because the low-cost roads were not properly maintained. The low-cost roads, kept in condition, would have answered the needs of the community, and as a greater mileage could be built and maintained than with the high-cost section built, the whole community would have been better off.

It is not to be expected that such a community will take care of the high-cost road. In a few years the wreck of the high-cost section will probably, for the sake of a little maintenance, be on a par with the other poor roads.

* Extract from paper read at Road Convention held at Manitoba Agricultural College on March 5th last.

LOCAL LOANS.

A WEST HAM APPLICATION.

In the House of Commons on Wednesday Mr. W. Thorne asked the President of the Local Government Board whether he was aware that the West Ham Corporation made an application to the Local Government Board for a loan of £20,000 for the purpose of extending their asylum at Goodmayes, and that the overcrowding at the asylum was seriously affecting the health of the patients, and if he could give any reasons why permission to obtain the loan has been refused.

Mr. Herbert Samuel stated that the town council of West Ham had applied to the Local Government Board for sanction to a loan of £4,532 for extensions at the asylum at Goodmayes. Sanction had not been refused by the board; but in view of the restrictions upon borrowing by local authorities at the present time the town council had been advised to communicate with the Home Office with a view to ascertain whether they would be able to obtain Treasury approval of the loan if the board were willing to sanction it.

Engineers and the War.—The whole staff in the engineering department of Glasgow University, including lecturers, assistants, demonstrators, and workmen in the laboratory have offered themselves in a body to the military authorities in case their services might be of use in connection with the provision of munitions of war.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

The premium for April is awarded to

Mr. E. W. Picot,
Fernside,
Handel-road,
The Polygon,
Southampton.

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:

474. Roof Truss.—When one end of a steel roof truss is supported on rubber bearings what provision is made to counteract the movement and to prevent damage to the slates and timbers? How would any movement in the truss affect the roof covering? How much, in a 40-ft. span roof, likely to move? ("T-Square.")

477. Levelling.—In a series of levels, if the first back sight read 3·25 on an ordnance bench mark of 28·30, the sum of the back sights be 12·95, and fore sights 17·20, what will be the ordnance reading of the last fore sight? (E. W. P., *Southampton.*)

478. Levelling.—It is required to find the difference of level of two pegs on opposite banks of a river, and it is known that the collimation line of the level will have to rise 1 in 2 out of adjustment. How would you find the difference of level required? (E. W. P., *Southampton.*)

479. Reservoir Dam.—Give sketch and description of an earth embankment, with clay puddle across a mountain brook 12 ft. wide, rising from each side of brook 1 in 2, the embankment to be 12 ft. high above the river bed. (R. P. M., *Newport.*)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

475. Hydraulics.—A pipe 5 in. in diameter delivers a certain quantity of water per minute with a loss of head of 4 ft. Determine the loss of head if the same quantity were delivered through a pipe 4 in. in diameter, assuming the same coefficient of friction.

By D'Arcy's formula we have

$$h = \frac{2 f L V^2}{g d}$$

where h = head in feet lost in friction
f = coefficient of friction
L = length of pipe in feet
V = velocity of water in feet per second
g = acceleration due to gravity
d = diameter of pipe in inches

$$\therefore V^2 = \frac{g d h}{2 f L}$$

$$\therefore a V^2 = \frac{a^2 g d h}{2 f L}, \text{ where } a = \text{cross-sectional area of pipe in square feet}$$

$$\therefore Q^2 = \frac{a^2 g d h}{2 f L}, \text{ where } Q = \text{discharge of pipe in cubic feet per second}$$

Then if d_1 = original diameter of pipe
d_2 = new " "
a_1 = original cross-sectional area of pipe
a_2 = new " " "
h_1 = original head lost in friction
h_2 = new amount of head lost in friction

We have $\frac{a_1^2 g d_1 h_1}{2 f L} = Q_2 = \frac{a_2^2 g d_2 h_2}{2 f L}$,

Q, f, L, and g being common to both expressions.

Substituting we get

$$4\left(\left(\pi\left(\frac{5}{12}\right)^2\right)^2\left(\frac{5}{12}\right)\right) = \left(\left(\pi\left(\frac{4}{12}\right)^2\right)^2\left(\frac{4}{12}\right)\right)$$

$$\therefore \frac{4 \times 5^5}{12^5} = \frac{4^5}{12^5} h_2 \quad \therefore h_2 = \frac{3125}{256} = 12{\cdot}2 \text{ feet}$$

Hawksley's formula for head lost in friction gives a similar result.

$$\text{Loss of head} = \sqrt{\frac{(3{\cdot}7 d)^5}{L}}$$

where Q = number of cubic feet per minute
d = diameter of pipe in inches
head = in feet
L = length of pipe in yards

Thus we have, using our previous notation,

$$Q = \sqrt{\frac{(3{\cdot}7 d_1)^5 h_1}{L}} = \sqrt{\frac{(3{\cdot}7 d_2)^5 h_2}{L}}$$

$$4^5 \times 5^5 = 4^5 \times h_2 \quad (\because h_1 = 4)$$

$$\therefore h_2 = \frac{3125}{256} = 12{\cdot}2 \text{ feet}$$

(B. K., *Newport, Mon.*)

476. Vectors.—State the essential properties of vector quantities, and distinguish between "vectors" and "scalars," giving two examples of each.

Forces are vector quantities—that is, they can be represented in magnitude, direction and position by straight lines, and so the magnitude and direction, but not necessarily the position, of a number of forces is given by the law of vector addition—viz., the resultant or sum of the number of vector quantities. A scalar quantity is one not involving direction. Let lines 1, 2, 3, 4 (Fig 3) represent the lines of action of a system of forces applied to the parts of any structure, and the arrow-heads indicate the sense in which these forces are supposed to act.

If a figure be constructed having each of its lines parallel to one or other of these forces, and of a length proportional to the intensity of the force, this will constitute the polygon of forces.

Fig. 4.—Draw line AB parallel to force line 1, and representing by its length and direction the intensity and sense of the chosen force. From B, the extremity of line AB, draw BC parallel to the direction, and of a length proportionate to the intensity of the force applied along the path indicated by the arrow-headed line 2; continuing the same process, draw line CD parallel to and representative of force 3, and lastly draw line DE parallel to and representative of force 4. This unclosed polygon ABCDE (Fig. 4) is termed the polygon of the given forces, because each of its sides is a graphic representation of two special properties belonging to one of the applied forces—viz., its direction and intensity. There is a third property possessed by each applied force which is not given by this polygon; this third quality, which is termed the actual path of application of the force, is defined by the arrow-headed lines. If, in order to complete the polygon ABCDE (Fig. 4), a line AE be drawn joining the free ends, it can be proved that this line will be a graphic delineation of the resultant sense and magnitude of the applied four forces. It is clear the resultant of the first two forces AB and BC could be represented according to the principle of the triangle of forces by the line AC connecting the angular points A and C; again, replacing the first two forces by their graphic resultant AC, it follows by the same principle that the resultant of forces AC and CD will be defined in direction and intensity by the AD, and the resultant of the forces AD and DE will be represented by the line AE. But the line AD is the graphic sum or resultant of the forces AB, BC and CD; therefore the line AE will be the graphic sum or resultant of the forces AB, BC, CD and DE; or the line AE, measured in the sense of from A to E, is a graphic delineation of

the resultant magnitude and direction of the applied four forces.

Polar or Funicular Polygon of the Given System of Four Lines.—Take any point O (Fig 5) in the plane of forces, and draw from this point the lines OA, OB, OC, OD and OE. On Fig. 6 draw any line O^1O^1 across the force line 1, and parallel to the polar line OA of Fig. 5. Let O^1O^1 intersect the force line 1 in a point 1^1; from 1^1 draw line $1^1 2^1$ parallel to the polar line OB, intersecting the force line 2 in a point 2^1. From 2^1 draw line $2^1 3^1$ parallel to the polar line OC, intersecting the force line 3 in a point 3^1. From 3^1 draw line $3^1 4^1$ parallel to OD, intersecting the force line 4 in a point 4^1, and from 4^1 draw line $4^1 5^1$ parallel to OE, intersecting line O^1O^1 in a point 5^1.

The polygon $1^1 2^1 3^1 4^1 5^1 1^1$ (Fig. 6) is the polar or funicular polygon of the given system of force lines.

Since the position for the pole O (Fig. 5) can be pitched anywhere in the plane, it follows that for the same system of force lines there can be constructed relatively to different poles an indefinite number of polar polygons. Further, the line O^1O^1 (Fig. 6) was drawn parallel to line OA, which joins the pole O to the origin A of the polygon of forces (Fig. 5); but the position of the line O^1O^1 was not more definitely restricted—that is to say, this line can be moved parallel to itself into any other position in the plane. Consequently, since the direction of the lines composing the polar polygon are determined for any particular pole O, by the directions of lines issuing from that pole and passing to the angular points of the polygon of forces, it follows that by choosing the first line O^1O^1 in various positions in the plane there can be constructed a series of similar polar polygons all related to the same pole, and having their sides respectively parallel to each other. All polar polygons, whether drawn for the same or different poles, possess in common the singular property of indicating a point on the line of action of the resultant of the given system of forces. If a system of forces be applied to any structure in the objective paths 1, 2, 3, 4, (Fig 6), their resultant will pass through a point 5^1 determined by the intersection of the first and last lines O^1O^1 and $4^1 5^1$ of the polar polygon. Since the polygon of forces (Fig. 5) gives the direction and magnitude of the resultant as represented by line AE, it may be inferred that the three properties of the resultant force, expressing its sense, magnitude and line of action, are furnished by means of the two figures, denominated the polar polygon and the polygon of forces.

Hence a line drawn through the point 5^1 (Fig. 6) parallel and equal to the line AE (Fig 5), will represent not only the sense and magnitude of the resultant force, but also the actual path of its application. (E. W. P., *Southampton.*)

Fig. 1

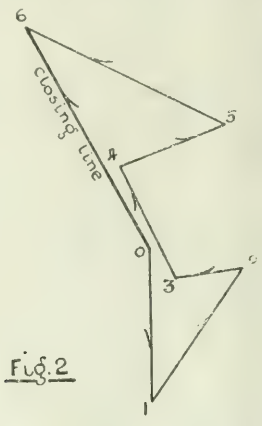


Fig. 2

Vector polygon

Vector quantities are those which require both a magnitude and direction to completely define them. Quantities such as force, velocity and acceleration are vectors. The numerical value of a vector is called the "tensor"—*i.e.*, the tensor of a vector. The direction is called the "ort." Any quantity which has magnitude and direction is a vector. In vector algebra clockwise direction is considered negative, and counter-clockwise direction is considered positive. An underlined symbol denotes a vector quantity, thus: $\underline{a}$ is a vector quantity, $\underline{a}_x$ is a vector quantity with magnitude a and direction α. Scalar quantities only require an arithmetical number to completely express them, or to express the number of times they contain a certain unit—*e.g.*, the area of a triangle, temperature work, &c. The length 3 miles is a scalar quantity; 3 miles N.E. is a vector quantity. If we are told a boat has a speed of 15 miles per hour from a certain point, we are given a scalar quantity, and we shall be ignorant of the boat's position when it leaves the starting-point; but if we are told that the speed is 15 miles per hour due north, we know the direction, and can find the boat's position relative to the starting-point after a certain time has elapsed. Vectors may be added together algebraically or graphically. (J. W., *Leeds.*)

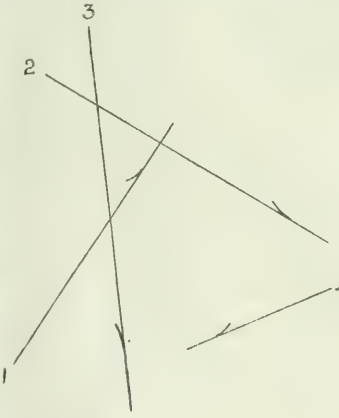


Fig. 3

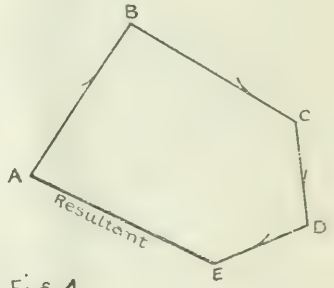


Fig. 4

Polygon of forces

Henry Saxon Snell Prize.—The Royal Sanitary Institute announce that the prize of fifty guineas and the silver medal of the institute is offered this year for an essay on "Suggestions for Improvements in the Sanitary Arrangements and Appliances suitable on Board Ship for (*a*) Passengers and crew, (*b*) Cattle and other live stock." Further particulars can be obtained from the offices of the institute.

ATHERSTONE COUNCIL'S STONE CONTRACT.

OBJECTION TO QUARRY OWNERS' AGREEMENT.

At a meeting of the Atherstone (Warwick) Rural District Council (reports the *Birmingham Post*), the chairman, Mr. W. G. Phillips, called attention to the fact that the contract for stone had been given to one firm, and said the committee had departed from the usual practice of dividing it among three local quarries. Was there any difference in the price of the tenders?

The vice-chairman, Mr. T. Slack, said there was no difference in price. The Highway Committee took the matter into consideration fully, and came to the conclusion that it was in the interests of the council that one firm should have the contract. It was no use advertising for tenders if all the quarry owners agreed to send in the same quotations.

The chairman: You seem to have an idea that there is a combination among the quarry owners. I have told you before that is not so, but your wisdom seems to carry you so much further than mine. The firms have agreed simply upon a price that they consider remunerative, and when I tell you that I speak with authority. It has been a rule that the council's orders for stone should be divided equally. Of course, if one firm sent in a lower price the other quarry owners would not be able to grumble. Seeing that all the prices are the same, and that all the quarry owners are large ratepayers in the district, the old practice should have been observed. However, you will find that you will not gain anything by the new method.

The vice-chairman said it was not the first time the Highway Committee had given the contract to one firm, but on the previous occasion the firm would not accept it unless the contract were divided between several quarry owners.

AGREEMENT AS TO PRICE.

Rev. H. Wilson Lee: I hate these combines, which destroy healthy competition.

The chairman repeated that there was no combination among the quarry owners. Personally, he did not care twopence about the matter. It would neither set up the quarry in which he was interested nor would it break it down.

Mr. S. Adams remarked that there must be an agreement between these firms.

The chairman: They have agreed upon a price, but you will not break it down by the course you have adopted.

The vice-chairman: Where is the need for advertising when you get the same prices?

The Rev. Wilson Lee said it was the council's business to do the best they could for the district.

The chairman: You must measure what you do for the district in terms of £ s. d. I protest against what has been done, and undertake to say that the surveyor will not get on as well with one firm as he did with three. I speak feelingly, as I am probably the largest ratepayer in the district. The council have departed from a fixed policy without saving a single sixpence.

The Rev. Wilson Lee: That is not a fair argument to raise, as I am as large a ratepayer in proportion as you are.

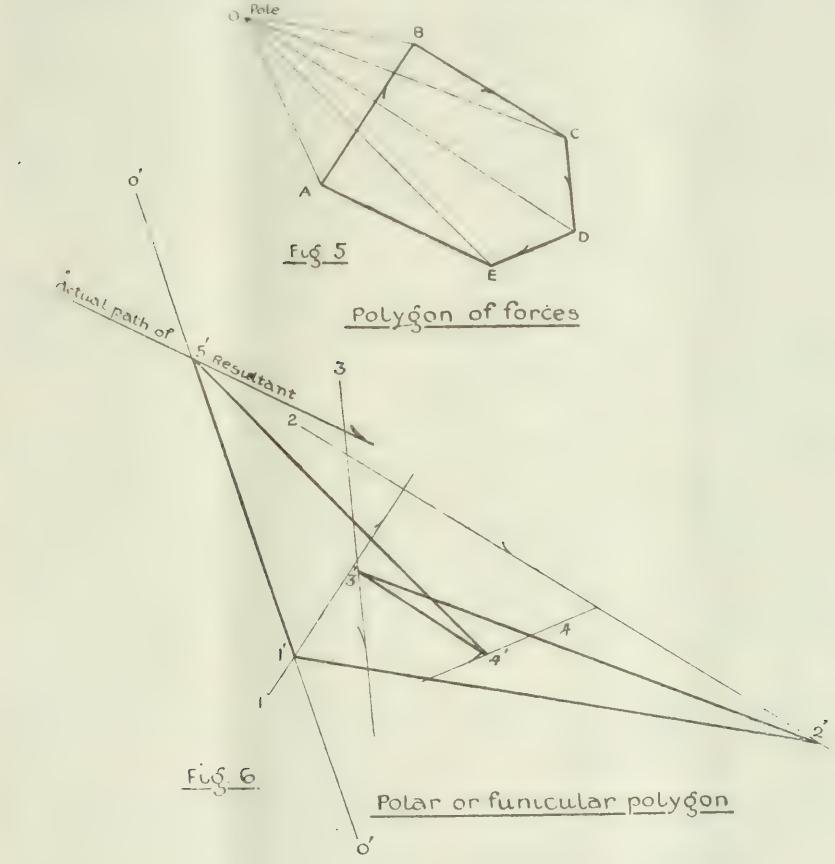
The chairman: I have told the surveyor this: "You must not consign any of that stone to my sidings, because I will not have it there." I tell you candidly that the sidings will not be used for that purpose.

Several members: Don't say that, Mr. Chairman!

The vice-chairman: I thought it did not concern you!

The chairman: It does as a matter of principle.

The subject then dropped.



Middlesex County Council and Quantity Surveyors.—The Middlesex County Council have agreed to fix the rate of remuneration to any quantity surveyors employed at 1½ per cent on contracts of £2,000 or under, 1¼ per cent between £2,000 and £5,000, and 1 per cent beyond £5,000.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Burnley, Kingston-on-Thames, Rochdale; housing and town planning—Newcastle-on-Tyne, Weymouth; roads and materials—Greenwich, York; sewerage and sewage disposal—Manchester, York.—Particulars of other projected works will be found in our "Local Government Board Inquiries" page.

ADMINISTRATION.

Cork T.C.—With reference to certain statements made at a previous meeting of the Works Committee, the city engineer, Mr. J. F. Delaney, said it had been asserted that his staff had been doubled of recent years. When he took up office there were eight men on his staff, costing £13 12s. per week. At present his staff was costing £14 11s. 3d. per week, and there were seven men in his office; so that, instead of his staff having been doubled, he was short-handed. All the staff in the office had received increases by Order in Council. In 1905 his chief clerk died, and he reorganised his staff. Every assistant was given an increase, which effected an economy of £84 10s. per annum. The reorganisation reported last week to the committee, on which the question arose, meant a saving in that branch of the department of £39 per annum.

BUILDINGS.

Brighton T.C.—The Library Committee recommend the council to carry out repairs to the roof of the Booth Museum.

Burnley T.C.—The provision of a tuberculosis hospital at Crown Point is being considered by the Health Committee.

Clitheroe T.C.—A new technical school, designed by the county architect, Mr. H. Littler, has been built in York-road. Messrs. J. Bleazard & Sons were the contractors, and the cost was £20,000.

Grangemouth T.C.—Improvements are to be carried out at the reservoir, at an estimated cost of £300.

Guildford R.D.C.—A contribution of £975 has been made by the county council towards the cost of the reconstruction of Broadmead, Cartbridge, Hatch and Round Hole bridges. A letter having been received from the War Department Lands Office, Aldershot, forwarding a military requisition for the reconstruction of Curzon Bridge, across the Basingstoke Canal, at Pirbright, the surveyor, Mr. J. Anstee, was directed to prepare plans and estimate of the cost of reconstructing the bridge, and forward them to the War Department as requested. The surveyor was also directed to prepare an estimate of the cost of repairing Wisley Bridge.

Kent C.C.—A scheme has been passed for the rebuilding of the offices at the North Preston school, at an estimated cost of £700.

Kingston-on-Thames T.C.—It is proposed to build a new elementary school with accommodation for 1,000 children.

Lowestoft T.C.—The question of providing a dental clinic is under consideration.

Middlesbrough T.C.—The Sanatorium Committee are negotiating with the Darlington Corporation with respect to a proposed joint tuberculosis sanatorium.

Rochdale T.C.—The Health Committee have approved plans for a sanatorium for consumptives which it is proposed to erect at an estimated cost of about £14,000.

Swansea T.C.—A building comprising a new police station and courts in Alexandra road has been completed.

HOUSING AND TOWN PLANNING.

Atherstone R.D.C.—The surveyor, Mr. H. J. Coleby, on Tuesday last submitted plans and estimates of a scheme for the erection of sixty-nine working-class dwellings on land which has been acquired for the purpose on the Coleshill-road. It was decided to submit the whole scheme to the Local Government Board for their approval, and permission was given by the council, in the first instance, for the building of twelve houses.

Bradford U.D.C.—Acting upon the request of the council, Mr. Selfe and the surveyor, Mr. R. B. Lees, inspected and reported as to the working of the kitchen ranges in the council's working-class dwellings in Frome-road. Mr. Selfe said he did not think the ranges would ever be much good. Both the surveyor and himself advised the substitution of closed for open ranges. Mr. Solomon: I think the chairman once said these houses would give us some experience, and I think we have got it. Eventually it was decided that the surveyor should dispose of the existing ranges to the best advantage, and put in the type recommended.

Newcastle-on-Tyne T.C.—The council on Wednesday resumed its discussion of the proposal to erect 688 dwellings of various types on its estate at Walker, the cost being £117,000, and the estimates showing a small surplus. Arguments in favour were the house famine in Newcastle, and the desirability of developing the estate with good class dwellings, while the Labour members held that the scheme would facilitate the provision of homes for munition workers coming to the city. The opposition argued that the time for such an expenditure was inopportune, and it was also suggested that the Treasury would not permit the money to be expended. The scheme was adopted.

Weymouth T.C.—The Local Government Board have sanctioned a scheme for the erection of 150 workmen's houses, at an estimated cost of £40,000.

PARKS AND OPEN SPACES.

Bangor (Co. Down) U.D.C.—Negotiations are to be opened for the purchase of 9 acres of land on Seacliff-road for the purpose of a public park. The approximate price is £2,700 for the ground and two villas.

Worcester T.C.—The General Purposes Committee have been authorised to carry out paving operations in Fort Royal Park, if considered desirable.

ROADS AND MATERIALS.

Anglesey C.C.—With regard to three out of four of the county council's proposals for surface tarring of roads in the county, the Road Board have intimated that they are prepared to make a grant of £425, being half of an estimated expenditure under this head of £850.

Beccles T.C.—It was reported by the Sanitary Committee that their requirements to September 1st will include £350 for granite, £120 for broken flint, £20 for channelling, £130 for tar-painting, and £60 for steam rolling.

Berkhampstead U.D.C.—The council have instructed the surveyor, Mr. J. R. Hadfield, to carry out the annual tar-spraying. In answer to a councillor, the surveyor said he was of opinion that 5 ft. was the proper margin to leave untarred on inclined roads.

Bermondsey B.C.—It has been decided to adopt the suggestion made by the Commissioner of Police, and have the kerbs whitened with the object of avoiding street accidents.

Cambridge T.C.—The council have passed a resolution asking the county council to declare a further list of roads in the borough main roads. Should the application be complied with the total length of roads to be mained will be about 4¾ miles.

Chester T.C.—It is proposed to repave Newgate-street with reinforced concrete, at an estimated cost of £200.

Cirencester U.D.C.—The sanction of the Local Government Board is to be sought for a scheme of improvement at Bishop's Corner.

Croydon T.C.—A scheme has been approved for making up Shirley Park-road, at an estimated cost of £1,140.

Exeter T.C.—It has been agreed to spend £1,100 on tar-spraying. The city surveyor, Mr. T. Moulding, stated that tar was costing twice as much as formerly.

Greenwich B.C.—A number of schemes of road repair have been submitted by the Highways Committee for the approval of the borough council.

Lancashire C.C.—The Main Roads and Bridges Committee, in a report on a recent circular letter issued by the Local Government Board, points out that the refusal of the Local Government Board to sanction capital expenditure on a main road which is in such a state that reconstruction with granite

... concrete or with tar-macadam, as ... necessary, subject to a loan to the Road Board being ... Such a road must be maintained in a condition so that it will not become objectionable, and if this has to be done out of revenue for one, two or three years, a large expenditure will be necessary, with the knowledge that as soon as sanction is obtained the reconstruction out of capital must be carried out. This expenditure out of revenue cannot be defended on economic grounds, and, as there are several cases of main roads needing reconstruction at the present moment by the methods mentioned, the committee feel that they might find it necessary to make representations to the Board on the matter.

Lancaster T.C.—The council have agreed to sanction a scheme for widening Caton-road, at a cost of £2,015, towards which the Road Board and the county council will contribute £1,500.

Oystermouth U.D.C.—The surveyor, Mr. W. P. Pettit-Jones, is preparing plans for making up the streets under the Private Street Works Act.

Rugeley U.D.C.—Mr. W. E. Rogers, surveyor, had prepared a plan for the widening of Hagley-road, but, as the terms offered by the Road Board to cover part of the cost were not considered satisfactory, it has been decided to confine the operations to levelling, ... and ... It has also been agreed to ... parish hall and the ... Church.

Shoreham U.D.C.—Application is to be made to the Road Board for a further contribution of £100 on account in respect of the expenditure on roads.

Stoke Newington B.C.—With reference to the ... plant by a ... of the dust nuisance in the northern part of the borough, it was explained that the council had a difficulty in obtaining horses and men to do street watering.

Twickenham U.D.C.—It has been decided to make up under the Private Street Works Act, 1892, that portion of Cambridge-road, which has not yet been ... a public ...

Wandsworth B.C.—The council have agreed to inform the Commissioners of Police that they would be prepared to give effect to the proposal that the kerbs of dark corners and at refuges which were not adequately lighted should be whitened.

Worcester T.C.—It has been agreed to apply to the Local Government Board for a Provisional Order authorising the compulsory purchase of such properties as were required for the widening of High-street, one of the principal thoroughfares of the city. It has also been resolved to apply for compulsory powers in regard to the improvement of St. Martin's Gate.

Worthing T.C.—The council have agreed to the scheme for making up Grand-avenue under the Private Street Works Act, and that in the event of certain owners refusing to withdraw their objections the necessary steps be taken to have the matter decided by the Justices.

York T.C.—Application has been made to the Treasury for authority to carry out a scheme for laying tar-macadam in Bootham-road, at an estimated cost of £3,000, to be provided by the Road Board.

SEWERAGE AND SEWAGE DISPOSAL.

Beccles T.C.—It is proposed to carry out a sewerage scheme in Swines-lane, at an estimated cost of £200.

Burton T.C.—The Local Government Board have intimated their inability at present to sanction a loan of £30,000 which the corporation wish to raise for carrying out the duplication of the sewerage rising main. The corporation regard their scheme as absolutely imperative if a repetition of the bursting of the rising main and consequent liability for legal proceedings are to be avoided. Tenders for the supply of pipes in connection with the work have been accepted provisionally, and the first instalment of the anticipated loan was included in the estimates for the current year.

Cardiff T.C.—The Treasury have been asked to sanction a scheme of drainage through the cemetery, the estimated cost being £3,500.

Farnham R.D.C.—Consideration is being given to a proposed scheme of sewerage for Hindhead, Frensham.

Manchester T.C.—Extensions at the Davyhulme sewage works are to be carried out, at an estimated cost of £23,000.

Twickenham U.D.C.—The surveyor, Mr. F. W. Pearce, reported that, in dealing with the question of combined drainage, it had hitherto been the practice, in cases where the council had accepted the responsibility for relaying the main line of drain, to allow such main line of drain to be still used as a combined drain with one intercepting trap and ventilating shaft for the whole of the various premises communicating therewith. It would, however, he thought, be desirable in future that that practice should be discontinued, and that, in cases where the contention was set up by the owners that the main line of drain was a public sewer vested in the council, the by-law distinction between a sewer and a drain should be strictly enforced, and the owners required to provide a separate line of drains, with the necessary intercepting chamber and ventilating pipes or shafts, for each ... The ... suggested was adopted by the council.

Wolverhampton T.C.—Progress is being made with the scheme for the abolition of the pan system. The chief sanitary inspector, Mr. John Peers, reports that up to date upwards of 3,000 water-closets have been completed.

York T.C.—As a matter of urgency, the sanction of the Treasury is being asked to the construction of a new sewer at Yearsley Bridge, at an estimated cost of £[illegible].

WATER, GAS, AND ELECTRICITY.

Coventry T.C.—The electricity undertaking carried a net profit of £[illegible] in the last financial year.

Dungannon U.D.C.—A notification has been received from the Local Government Board that they will grant a Provisional Order for the improvement of the local water supply in the terms of the petition lodged by this council and the rural district council.

Omagh U.D.C.—The gas trading profits last year were £1,[illegible].

Poplar B.C.—The Electricity Committee, in their report of the undertaking during the past year, state that the working costs had decreased. The permanent ... from £[illegible] in 1908 to £[illegible] in 1911 and the nett profit had gone up from £2,700 in 1908 to over £8,000 last year. Wages and salaries had gone up very largely—from £9,155 to £17,500. Notwithstanding these increases, they had increased the profits. The average selling price per unit had gone down from 1·6d. to ·97d. (less than 1d.), which is a great ...

MISCELLANEOUS.

Chiswick U.D.C.—The chairmen of the various committees were some time ago empowered to deal with ordinary matters arising out of work under the committee's control, simply reporting if the work was proceeding satisfactorily, and bringing up reports, if necessary, on directions given, and recommending action in matters affecting principles. The work, it is stated, has proceeded so smoothly and well that the system is to be continued for the duration of the war.

PROPOSED TUBERCULOSIS HOSPITAL FOR SOUTHEND-ON-SEA.

In the competition for the design of a proposed tuberculosis hospital for Southend-on-Sea the premiums offered have been awarded as follows:—

First Award: Mr. Percy Brockbank, 13, 14 and 15 County Chambers, Southend-on-Sea.

Second Award: Mr. H. Lord, 42 Deansgate, Manchester.

Third Award: Mr. J. Jameson Green, Adelphi Bank Chambers, 19 South John-street, Liverpool.

The assessors, Messrs. Frank Whitmore, consulting architect to the Essex County Council, Ernest J. Elford, M.INST.C.E., the borough engineer and surveyor, and C. Grant Pugh, the medical officer of health, describe Mr. Brockbank's scheme as very carefully prepared and thought out. The buildings are grouped at the extreme northern portion of the site. The administration block lies between the two ward pavilions, all facing south. The living hall and kitchen block lies behind, and is connected with the administration block and pavilions by two covered ways. The laundry and disinfecting block is in the rear. The future extension shows, south of the pavilion to be erected forthwith, a pavilion with further accommodation for adults and special provision for children.

PERSONAL.

Mr. Tough, electrical engineer to the Coventry Corporation, has had his salary increased from £650 to £700 a year.

Mr. A. O. Harpur, surveyor to the Caerphilly Urban District Council, has resigned after twenty-one years' service, owing to ill-health.

Mr. S. R. Lowcock, M.INST.C.E., and Mr. Arthur J. Martin, M.INST.C.E., have been elected members of the council of the Royal Sanitary Institute.

Mr. W. A. Jackson, surveyor to the Malton Urban District Council, has been voted £21 for extra services in connection with the construction of sewers and water mains.

Sergeant H. Y. Maulkinson, 5th Lincolnshire Regiment, late surveyor to the Mablethorpe Urban District Council, has been gazetted 2nd Lieutenant, 7th Batt Lincolnshire Regiment.

Mr. H. O. Hooper, draughtsman in the Torquay Borough surveyor's office, has been invited to take over the duties of building inspector in addition to his present work, at an extra remuneration of 15s. per week.

Mr. W. Willis Gale, ASSOC.M.INST.C.E., surveyor to the Carshalton Urban District Council, underwent a somewhat severe operation last week, and is now at a London nursing home. We are glad to be able to state that he is making most satisfactory progress.

Mr. George Roper Norrish, for many years manager to the St. Saviour's District Board of Works, London, died recently, we regret to state. The district board was incorporated in the area administered by the Southwark Borough Council, and Mr. Norrish retired with a pension.

Mr. W. Harpur, city engineer of Cardiff, was congratulated on Tuesday last by Alderman W. Roberts, at the meeting of the Public Works Committee, on his return after a short leave of absence owing to indisposition. Mr. Harpur thanked the members, and said his health was much improved.

Mr. T. B. Farrington, civil engineer, who died at Llandudno last week at the age of sixty-one, was well known in Manchester and North Wales. Articled to Messrs. Maxwell & Tuke, of Manchester, he had much to do on behalf of that firm in planning the winter gardens at Southport and in laying out St. Annes-on-Sea.

Mr. C. Gillard, assistant borough surveyor of Torquay, who has discharged the duties of the borough surveyor, Mr. H. A. Garrett, during the absence of that gentleman on active service since the outbreak of the war, has been granted an additional £5 5s. per month in consideration of extra duties, and also because of the satisfactory manner in which he has carried out the work of the department.

Dr. Samuel Rideal, F.I.C. (London), Messrs. Martin Deacon, M.INST.C.E. (Liverpool), John Parker, ASSOC.M. INST.C.E., city surveyor and waterworks engineer, Hereford, and J. Parry, M.INST.C.E., are among those who will take part in the discussion on the value of mechanical filters in the purification of water which is to be opened by Dr. Thomas Orr at a meeting of the Royal Sanitary Institute at Shrewsbury on Friday, the 28th inst.

One of the speakers at the recent Newark meeting in connection with the North-Eastern and Eastern District of the Institution of Municipal Engineers, in the course of his remarks instanced the case of the present borough surveyor of Newark (Mr. T. Peirson Frank), "who was leaving a post at £250 to take one which would rise to £750." This is, of course, somewhat misleading, as Mr. Frank is leaving a post at £450 to take one the remuneration of which will rise to £700.

Mr. A. D. Greatorex, M.INST.C.E., borough engineer and surveyor, West Bromwich, past-president of the Institution of Municipal and County Engineers, has been granted leave of absence by the town council, and gazetted as a lieutenant in the Territorial Force Reserve, and appointed to No. 1 Supernumerary Company, 2/6th South Staffs Regiment. Mr. Greatorex was formerly a lieutenant in the Hampshire Artillery Volunteers, and has been a member of the Staffs National Reserves since their foundation about three years ago. The company to which Mr. Greatorex has been appointed consists of National Reservists, and will be used for guard purposes.

Mr. J. Cracroft Haller's appointment to the county surveyorship of Notts, notified last week, was made on the recommendation of the Highways, Bridges and County Buildings Committee of the county council. Colonel Sir Lancelot Rolleston, in moving the adoption of the report, observed that the council were fortunate in securing the services of one who was already acquainted with the roads and methods of the county. The committee believed that Mr. Haller would serve the county most efficiently. Mr. Haller has held the position of chief engineering assistant to the late county surveyor, Mr. E. Purnell Hooley, M.INST.C.E., since June 1, 1914, and for the past three months has been acting county surveyor. Prior to entering the service of the Notts County Council, he was for ten years engineer and surveyor to the Carlton (Notts) Urban District Council, where he carried out many schemes of importance, and previous to this was at Guiseley for three and a-half years. Mr. Haller was articled to his father, Mr. J. C. Haller, ASSOC.M. INST.C.E., of Dewsbury.

The Road Board's New Regulations.—Mr. W. G. Bryning, the North Riding county surveyor, in an interview with a *Yorkshire Post* representative, in reference to the Road Board's new regulations, said he thought it would be a great pity if the Road Board withdrew, or reduced, their grants at the present juncture, especially in the North Riding, in view of the vastly increased traffic generally throughout the Riding caused by the military operations. The regulations had been under the consideration of the Highways and Bridges Committee, and will be discussed at the county council at their quarterly meeting on Wednesday week.

FOR OTHER ADVERTISEMENTS
See End of Paper.

HANWELL URBAN DISTRICT COUNCIL.
DESTRUCTOR AND SEWAGE WORKS MANAGER.

The Council are prepared to receive applications for the above appointment, the salary attached to which will be £2 per week, together with house and garden rent free.

Applicants must be thoroughly conversant with the working of a Destructor, the running of Steam and other Machinery, treatment of sewage by Chemical Precipitation and Filtration through Contact Beds and Revolving Sprinklers, and the cropping of a small Farm.

A Form of Application and List of Duties will be forwarded upon application.

Applications, in candidate's own handwriting, in envelopes supplied, enclosing copies of not more than three testimonials of recent date, to be delivered not later than Thursday, 20th May.

SIDNEY W. BARNES, ASSOC.M.INST.C.E.,
Surveyor to the Council.

Council Offices,
Hanwell, W.
May 5, 1915. (2,564)

URBAN DISTRICT OF FINCHLEY.
PRIVATE STREET WORKS.

The Council of the above-named District invites Tenders for the making up of Holly-park (Second Portion), together with all works incidental thereto.

Plans and Conditions of Contract may be seen, and Forms of Tender, Specification and Schedules of Quantities obtained, on application to the Council's Engineer, Mr. C. J. Jenkin, M.INST.C.E., at the undermentioned address.

A deposit of £2 will be required, which will be returned on receipt of a *bonâ-fide* Tender on the prescribed Form for the whole of the works, together with fully priced-in Schedules and the return of all papers issued.

Sealed Tenders, endorsed "Holly-park, Second Portion," to be addressed to the undersigned, and delivered not later than 4 p.m. on the 31st instant.

The Council does not bind itself to accept the lowest or any Tenders.

E. H. LISTER,
Clerk of the Council.

Council Offices,
Church End,
Finchley, N.
May 5, 1915. (2,565)

CITY OF LONDON NATIONAL GUARD VOLUNTEER CORPS ENGINEERS' UNIT.

The first parade of the Engineers' Unit, [illegible] special branch of the City of London National Guard and constituted by order [illegible] as a unit of the Corps of Volunteer Engineers [illegible] in process of organisation by the Central Association of Volunteer Training Corps, took place on Wednesday, April 21st, at the headquarters of the London Brigade R.G.A., Elthorne road, Highbury, N.

The staff and committee of the Engineers' Unit were represented by Colonel C. E. Cassal, V.D., Officer Commanding; Mr. W. Noble Twelvetrees, Acting Adjutant; Mr. R. St. George Moore, Platoon Commander; the Rt. Hon. Lord Headley, chairman of committee; [illegible] being Colonel C. L. E. Coleridge, V.D., Regimental Commandant of the City of London National Guard, and Captain G. [illegible] Officer Commanding the Headquarters Depot of the London Brigade R.G.A.

There was a good number of members of the unit, who were addressed by Colonel Cassal, and afterwards went through various evolutions under the command of Platoon-Commander St. George Moore. It is gratifying to note that a sufficient number of engineers have already been enrolled to form one complete platoon, and it is hoped that engineers and others will come forward without delay so as to ensure the organisation of the [illegible] company at an early date.

The Engineers' Unit are to be congratulated on the fact that they have received permission to drill at the headquarters of the London Brigade Royal Garrison Artillery, which include a fine drill hall and a parade ground covering an area of about an acre, thus affording ample space for effective military training. For this privilege the unit are indebted to the courtesy of the Officer Commanding the London Brigade R.G.A., and of the County of London Territorial Association.

We are informed that drills will be held on Tuesday, Wednesday and Thursday evenings each week, at 8.30 p.m. The headquarters are within five minutes' walk from Highbury Station (N.L.R. and City and Finsbury Park Tube), and from Caledonian-road Station (Piccadilly Tube), and are readily accessible from all parts of London. Full particulars relative to the unit, together with application forms for membership, can be obtained from the Acting-Adjutant of the unit, Mr. W. Noble Twelvetrees, M.I.MECH.E., 195 Bedford-hill, London, S.W., or from Headquarters, City of London National Guard.

The Committee of the Engineers' Unit has been constituted as follows, with power to add to their number:—

The Rt. Hon. Lord Headley, M.INST.C.E.I., F.S.E., M.R.SAN.I. (chairman).

H. Percy Boulnois, M.INST.C.E., late deputy chief engineering inspector Local Government Board, representing the Royal Sanitary Institute.

Colonel Cassal, V.D., F.I.C., F.C.S., F.R.SAN.I. (Officer Commanding).

R. St. George Moore, M.INST.C.E.

Captain W. H. Prescott, R.E., M.INST.C.E., M.I.MECH.E., barrister-at-law, representing the Institution of Municipal and County Engineers.

Norman Scorgie, M.INST.C.E., member of council, Institution of Municipal and County Engineers, representing the Society of Engineers (Incorporated).

W. Noble Twelvetrees, M.I.MECH.E., M.SOC.C.E. (FRANCE), A.M.I.E.E. (hon. secretary).

Dendy Watney, F.S.I., representing the Surveyors' Institution.

A correspondent writes: "On p. 574 of THE SURVEYOR of last week I notice a statement to the effect that Captain W. H. Prescott was appointed as the representative of the Institution of Municipal and County Engineers on the committee of the City of London National Guard Volunteer Corps. This is not correct, as Captain Prescott was actually appointed on the committee of the Engineers' Unit, which is quite independent of the infantry battalions of the National Guard." We gladly insert this correction, but would mention that the statement referred to formed part of the official report of the last meeting of the council of the Institution of Municipal and County Engineers.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President: Mr. J. S. PICKERING, M.INST.C.E., Borough Surveyor and Water Engineer, Cheltenham.

SCARBOROUGH MEETING.

An institution meeting will be held in the North-Eastern District at Scarborough to-morrow (Saturday).

PROGRAMME.

10 a.m.—Assemble at the town hall.

10.15 a.m.—Reception by his Worship the Mayor (Mr. C. C. Graham). A paper entitled "Catering for the Wants of the Holiday-maker," by Mr. Harry W. Smith, ASSOC.M.INST.C.E., borough engineer and surveyor, will be taken as read. Any discussion thereon may take place at the close of the meeting after the various works have been inspected.

10.45 a.m.—Inspection of Spa improvements, beach bungalows, South Cliff Gardens, bathing pool, &c., in the South Bay.

1 p.m.—Lunch at the Grand Hotel. (Tickets, 3s. each.)

2 p.m.—Meeting of the members of the North-Eastern District to consider—

(*a*) The report of the Executive Committee as to the desirability of reporting the proceedings of district meetings in the Press.

(*b*) Any other business.

2.30 p.m.—Leave the Grand Hotel by char-à-banc (tickets 2s. each) for the Castle Hill, to view the damage caused by the bombardment on December 16, 1914, by the German battleships, and to inspect the Keep.

3.15 p.m.—Leave the Castle Hill, and inspect the Alexandra Gardens, Floral Hall, Peasholm Park, and the beach bungalows and bathing establishment in the North Bay.

4.30 p.m.—Leave the north end of the Royal Albert-drive by motor char-à-banc for drive along the Marine-drive, Valley Park, to the Mere.

5.15 p.m.—Afternoon tea at the town hall by the kind invitation of his Worship the Mayor (Mr. C. C. Graham).

AYR MEETING.

At the Scottish District annual meeting to be held at Ayr on June 4th and 5th, papers on town planning, municipal housing, road work, and scraping of water mains will be submitted.

On the first day visits will be paid to the municipal works of the town, and the following day will be devoted to inspections of experimental road stretches in Ayr County and Hillhouse Quarry, and to a visit to Loch Doon.

MATLOCK MEETING.

The arrangements for the institution meeting to be held at Matlock on June 12th include visits to the new sewage works, the brine and electric baths, and other undertakings.

J. W. DUDLEY ROBINSON,
Secretary.

92 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President: Mr. W. H. MATTHEWS JONES, City Engineer and Surveyor, Chester.

COUNCIL MEETING.

At a meeting of the council held in London on April 28th the following applicants were recommended for admission:—

To Membership: Messrs. R. A. Gandy, borough surveyor's office, Bedford, and W. B. Geach, surveyor, St. Columb Rural District Council.

To Associate Membership: Mr. R. H. Hampton, borough surveyor's office, Doncaster.

New Members, &c.—From the applicants recommended for admission at the last meeting three members and one associate member were elected.

Revision of By-laws.—In view of the proposed revision of by-laws, members are requested to submit to the council any suggestions they may have to make.

B. WYAND,
Secretary.

39 Victoria-street,

The next meeting of the council will be held in London on Wednesday, May 26th, at 5.30.

SOCIETY OF ENGINEERS.

A meeting of the Society of Engineers is to be held at the Institution of Electrical Engineers, Victoria Embankment, W.C., on Tuesday next, the 11th inst., when a paper entitled "Some Future Developments in Heating and Ventilation" will be read by Mr. Arthur H. Barker, M.Inst.C., B.A., B.Sc., the following being a synopsis:

Importance of science of heating and ventilation. Nature of problems yet unsolved. Difficulties of scientific treatment of the subject.—Convection currents and radiant energy. Human physiology and psychology in relation to the subject. Inadequacy of chemical tests for air purity.—Separate functions of the engineer and of the physiologist and hygienist. Temperature of a room.—Radiant temperature.—Questions to be unravelled.—Experiments at University College.—Instruments and apparatus for measuring temperature.—Effect of dust on the human organism. Laws of air movement.

The chair will be taken at 7.30 p.m. precisely.

A. S. E. Ackermann,
Secretary.

17 Victoria-street, S.W.

ROYAL SANITARY INSTITUTE.

SHREWSBURY MEETING.

Mr. H. Percy Boulnois, M.Inst.C.E., will occupy the chair at a meeting of the Royal Sanitary Institute which is to be held at the Guildhall, Shrewsbury, on Friday, May 28th, when a discussion on "The Value of Mechanical Filters in the Purification of Water" will be opened by Dr. Thomas Orr.

The proceedings will commence at 7.30 p.m.

On the following morning inspections will be made of the Shrewsbury housing scheme, Ditherington, mechanical filters at Chester-street, and the public abattoir. The members will be entertained to luncheon at one o'clock by the mayor.

BRISTOL MEETING.

On June 11th, at Bristol Guildhall, a discussion on "Co-ordination of Military and Civil Sanitary Services in War-time," will be opened by Dr. D. S. Davies, medical officer of health, and Mr. L. S. McKenzie, Assoc.M.Inst.C.E., city engineer of Bristol.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

SOUTHEND-ON-SEA MEETING.

By permission of the town council and the borough engineer, Mr. Ernest J. Elford, M.Inst.C.E., M.I.M.E., a visit will be paid to the Southchurch Sea sewage disposal works and refuse destructor to-morrow (Saturday). Objects of interest: Grit and screening chambers; modern sedimentation tanks; roughing filters; percolating filters; pumping station and plant, including Humphrey pump; destructor works.

Programme.

2.50 p.m.—Visitors to alight at Prittlewell Station (G.E.R.) and proceed to the works (five minutes).

3.15 p.m.—Visitors will be conducted over the works by the borough engineer, who will give a description of the works.

5 p.m.—Visitors will be entertained at tea.

Visitors arriving early will find the following places of great interest—viz.: Corporation promenade pier; swimming bath; esplanades; Boulevard, Thorpe Bay and Southchurch cliffs, bandstand, &c. Trains leave Liverpool-street (G.E.R.), 1.50 p.m.; Southend to Prittlewell, 1.35, 2.0, 2.15, 3.20. Trams from Southend to Prittlewell every fifteen minutes. Visitors from works.

WIMBLEDON MEETING.

On Saturday, May 29, 1915, a visit will be paid to the Wimbledon sewage works and the S.O.S. works, Durnsford-road, Wimbledon, near Wimbledon Park Station (District Railway).

Members to meet at 3 p.m. at pumping station, Durnsford-road, to view the pumping plant, lime mixing plant, filters and sludge pressing plant, the atomisation of sewage devised by the borough engineer (Mr. C. H. Cooper, M.Inst.C.E.), and the recovery of fats resulting from such treatment. Afterwards an inspection will be made of the S.O.S. works, and the products resulting from the destructive distillation of sewage sludge.

CONCRETE INSTITUTE.

The paper by Mr. E. A. W. Phillips, M.Inst.C.E., M.C.I., entitled "Lime Concrete in the East," which was to have been read on May 6th, will be read on May 22nd, at Denison House, Westminster, S.W., at 7.30 p.m.

It has been decided to abandon the fifth annual dinner this year.

H. Kempton Dyson,
Secretary.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1076) subject to later confirmation by letter.*

ASSISTANT TO SURVEYOR.—May 8th.—Maidstone Rural District Council. £2 10s. per week.—Mr. Thos. A. Bushridge, surveyor.

SURVEYOR.—May 8th.—Wirksworth Urban District Council. £90 per annum.—Mr. J. Gratton, clerk, Town Hall, Wirksworth.

ASSISTANT SANITARY INSPECTOR.—May 8th.—Corporation of Hornsey. £2 10s. per week. The Town Clerk.

GASWORKS ENGINEER AND MANAGER.—May 10th.—Spalding Urban District Council. £150, with residence.—The Clerk, Urban District Council.

CLERK OF WORKS.—May 10th.—Cheshunt Urban District Council. £2 10s. per week.—Mr. M. P. Daly, clerk.

INSPECTOR OF NUISANCES.—May 10th.—Annfield Plain Urban District Council. £130–£150. Mr. T. L. Watchman, clerk.

SURVEYOR.—May 11th.—Beddington and Wallington Urban District Council. £300 per annum. Mr. T. Booth, clerk, Council Offices, Manor-road, Wallington, Surrey.

GASWORKS SUPERINTENDENT.—May 12th.—Accrington District Gas and Water Board. £150 per annum.—Mr. C. Harrison, general manager.

ASSISTANT INSPECTOR.—May 14th.—Swansea Port Sanitary Authority. £91 per annum.—Mr. H. L. Canty, clerk, Guildhall.

BOROUGH SURVEYOR.—May 15th.—Newport (I.W.) Town Council. £225–£250 per annum.—Mr. T. Ross Pratt, town clerk.

SANITARY INSPECTOR.—May 18th.—Hayfield Rural District Council. £60 per annum.—Mr. J. R. Bowden, clerk, 16 High-street, New Mills.

INSPECTOR OF NUISANCES AND SURVEYOR.—May 18th.—Todmorden Rural District Council. £104 per annum.—Mr. F. Hollinrake, clerk, Union Offices, Todmorden.

FEMALE HEALTH VISITOR.—May 21st.—Mitcham Urban District Council. £100 per annum.—Mr. Robert M. Chart, clerk, pro tem.

SANITARY INSPECTOR.—May 21st.—Mitcham Urban District Council. £200.—Mr. Robert M. Chart, clerk, pro tem.

ROAD FOREMAN.—May 21st.—Mitcham Urban District Council. £2 per week.—Mr. Robert M. Chart, clerk, pro tem.

SURVEYOR. May 21st.—Mitcham Urban District Council. £250–£300.—Mr. Robert M. Chart, clerk, pro tem.

CLERK TO COUNCIL.—May 21st.—Mitcham Urban District Council. £250—£300.—Mr. Robert M. Chart, clerk, pro tem.

CLERK'S ASSISTANT.—May 21st.—Mitcham Urban District Council. £120—£150.—Mr. Robert M. Chart, clerk, pro tem.

CLERK OF WORKS.—Tyldesley Urban District Council. £2 10s. per week.—Mr. Francis E. Jones, engineer and surveyor, Council Offices, Tyldesley.

ASSISTANT ENGINEERS.—Public Works Department, Government of the Gold Coast. £350—£400 a year, with furnished quarters.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ENGINEER.—Public Works Department, British Guiana. £300—£400.—Crown Agents for the Colonies, Whitehall-gardens, S.W.

ENGINEERING AND SURVEYING ASSISTANT.—Derbyshire County Council. £150 per annum.—County Surveyor, County Offices, Derby

CLMENT INSPECTOR.—Federated Malay States Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those respectively for which it is recommended to arrange that they shall reach* THE SURVEYOR *by noon on* WEDNESDAYS *to ensure insertion in the weekly list of* SUMMARIES. *Such advertisements may, in case of emergency, only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

HALIFAX.—May 10th.—For erecting temporary dwelling at a school, for the Education Committee.—Mr. J. [illegible] engineer.

PUDSEY.—May 10th.—For plumber's and sanitary work at the Council Offices, for the Education Committee. Borough Engineer.

LANCASTER.—May 10th.—For the erection of an undertaker's cottage at Warrington, for the county council [illegible] Engineer, County Offices, Preston.

DARTON.—May 10th.—For the erection of boundary walls and other works, for the urban district council. Mr. S. W. [illegible]

HOLYWOOD.—May 10th.—For the construction of [illegible] Mr. J. A. Heaslip, Ocean Buildings, Belfast.

CARLISLE.—May 10th.—For the [illegible] Mr. F. Barker, surveyor.

CLAYMORRIS.—May 12th.—For [illegible] two single cottages and one double cottage, for the rural district council.—Mr. M. Cosgrave, engineer and architect.

DEVON.—May 13th.—[illegible] certain bridges, for the county council.—Mr. W. P. Robinson, county surveyor, 22 Queen-street, Exeter.

WITCHAM.—May 13th.—For the [illegible] the urban district council. Mr. J. B. Renton, surveyor.

GLASGOW.—May 13th.—[illegible] torium and children's home, for the corporation.—Mr. J. Lindsay, town clerk, Glasgow.

EAST LANCING.—May 17th.—For the erection of seven timber groynes at Shoreham, for the Sea Defence [illegible] civil engineers, 5 Little College-street, Westminster Abbey, S.W.

WITHERNSEA.—May 18th.—For the erection of a reinforced-concrete wall, for the urban district council.—Mr. J. H. B. Kirton, engineer.

DERWENT.—May 18th.—For the erection of a stable [illegible] Joint Small-pox Hospital Board.—Mr. H. B. Williams, architect, Town Hall, Workington.

WEYMOUTH.—For the erection of [illegible] town clerk.

Iron and Steel.

ST. PANCRAS.—May 11th.—For [illegible] tional work, for the borough council.—Mr. C. H. F. Barrett, town clerk.

PONTARDAWE.—May 11th.—For the supply of cast-iron water mains, with valves, for the rural district council.—The Engineer, Council Offices.

WELLINGBOROUGH.—May 12th.—For the erection of a steel Dutch barn at the sewage farm, for the urban district council.—Mr. R. S. Henshaw, engineer and surveyor.

GOSPORT AND ALVERSTOKE.—May 13th.—For the supply of a pair of 18-in. stroke horizontal cross high-pressure, double-acting air compressors, with all necessary valves, pipe connections and foundations, for the urban district council. Mr. H. Frost, engineer and surveyor, Gosport.

Roads.

JARROW.—May 8th.—For the cementing of footpaths, for the corporation.—Mr. J. Scott Weir, borough engineer, Town Hall.

MIDLOTHIAN.—May 8th.—For the supply of tools, ironmongery, brushes, oils, and other articles, for the roads department. Road Office, County Buildings, Edinburgh.

LEXDEN AND WINSTREE.—May 8th.—For the hire of one or two steam road rollers, for the rural district council.—Mr. John Ennals, surveyor, Lexden, Colchester.

NORTON.—May 10th.—For the supply of road materials and team labour, for the rural district council.—Mr. J. E. Moulding, clerk, The Edge, Sheffield.

HEBBURN.—May 10th.—For street works and extensions to reservoir, for the urban district council.—Mr. H. Lee, deputy surveyor, Council Offices.

BRIDGNORTH.—May 10th.—For the provision of horse, cart, and driver for hauling, for the corporation. Mr. J. H. Cooksey, clerk.

GREETLAND.—May 10th.—For the supply of macadam and Lancashire setts, for the urban district council.—Mr. F. J. Mallinson, surveyor.

HALIFAX.—May 10th.—For private street improvement works, for the corporation.—Mr. J. Lord, borough engineer.

COCKERMOUTH.—May 10th.—For repairs to roads, for the rural district council.—Mr. S. K. Gibson, surveyor, Grecian Villa, Cockermouth.

BERWICK.—May 11th.—For the supply of hand and machine broken whinstone and chips, for the sanitary authority.—Borough Surveyor.

SALCOMBE.—May 11th.—For the supply of 1½-in. broken blue Elvan stone, 2-in. broken limestone, blue Elvan chippings, and limestone chippings, for the urban district council.—Mr. J. G. Howard, surveyor.

MOUNTAIN ASH.—May 11th.—For the execution of street improvements, for the urban district council. Mr. W. G. Thomas, surveyor.

EAST GRINSTEAD.—May 12th.—For making good certain streets at Three Bridges, for the rural district council.—Mr. C. Turton, surveyor, 6 High-street, East Grinstead.

EAST GRINSTEAD.—May 12th.—For making up a road, for the rural district council.—Mr. C. Turton, surveyor, 6 High-street, East Grinstead.

HAWARDEN.—May 12th.—For the supply of road stones, for the rural district council.—Mr. W. Newton, district surveyor, Drury, Buckley, Chester.

WINSFORD.—May 12th.—For the supply of granite macadam and granite chippings, for the urban district council.—Mr. J. Wilkinson, surveyor.

SPENNYMOOR.—May 15th.—For the supply of tar and tarred slag, for the urban district council.—Mr. C. R. Spencer, surveyor.

MONMOUTH.—May 17th.—For the supply of materials, or for hauling stone for the repair of the main roads, for the county council.—Mr. W. Tanner, county surveyor, County Offices, Newport, Mon.

NORTH WALSHAM.—May 17th.—For the supply of broken granite and broken gravel, and road rolling, for the urban district council.—Mr. J. W. Stevens, surveyor.

WANDSWORTH.—May 18th.—For the supply of Thames ballast and sand, for the borough council.—Borough Surveyor.

WEMBLEY.—May 19th.—For making up a portion of a road, for the urban district council.—Mr. C. R. W. Chapman, surveyor.

EAST STOW.—May 19th.—For surface-water draining, kerbing, channelling, and road making, for the rural district council.—Mr. Henry E. Wilkes, clerk, [illegible]

Sanitary.

LANCHESTER.—May 10th.—For cleansing privies and ashpits, for the rural district council.—Mr. J. R. Lupton, Lanchester, Durham.

MORLEY.—May 18th.—For work of sewering, for the corporation.—Mr. F. Turner, borough engineer and surveyor.

BRADFORD.—May 18th.—For supplying and cleansing middens, for the corporation. Superintendent Call, Hammerton-street Depot.

FINCHLEY.—May 31st.—For the construction of soil and surface-water sewers in connection with the Woodhouse estate workmen's dwellings scheme, for the urban district council.—Mr. C. J. Jenkin, engineer and surveyor.

DORCHESTER.—For the supply of new or second hand screening and media washing machine, also hard burnt clinker or other filtering material for percolating filters, for the corporation.—Mr. H. D. Strange, borough surveyor.

Miscellaneous.

BIRKENHEAD. May 12th.—For the maintenance of 120 coal wagons belonging to the gas department, for the corporation.—Mr. T. O. Paterson, gas engineer, Gasworks, Thomas-street, Birkenhead.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

ALDERLEY EDGE.—Accepted for the supply of 240 tons of tar-macadam, for the urban district council. The Surveyor:—

Tarmac, Limited, Wolverhampton, 14s 6d. per ton.

BEATH.—Accepted for the erection of a school, for the School Board. Mr G. C. Campbell, architect, Methil, Fife:—

Mason Work.—A. Kinnear, Lundin Links, £3,519.
Joiner Work.—J. King & Co., Lochgelly, £2,854.
Slater Work.—J. Paul & Sons, Cowdenbeath, £530.
Plaster Work.—J. Adams, Lochgelly, £754.
Plumber Work.—S. Binning, Cowdenbeath, £910.
Asphalt Work.—F. B. Flood, Edinburgh, £191.
Smith Work.—J. Lessels, Dunfermline, £165.
Painter Work.—J. Millar, Leslie, £216.
Tile Work.—W. Field, Edinburgh, £152.
Heating.—Taylor & Fraser, £607.
Ventilating.—Donald & Donald, Glasgow, £126.
Electric Light.—Moncrieff Brothers, Methil, £187.

CRANBROOK.—For the construction of sewage disposal works, for the rural district council. Mr. J. H. Bailey, sanitary surveyor:—

Economic Drainage Company, London, S.W.	£767
Vine, Tunbridge Wells	606
S. F. Stanley & Sons, Marden*	596

HESTON AND ISLEWORTH.—For the supply of tar and Tarvia, for the urban district council.—Mr. J. G. Carey:—

TAR.

	Per gallon.
	d
Catchpole & Sons, London	4
Forbes, Abbott & Co., Limited, London	4¼
Grindley & Co., Limited, London	4¼
T. Clayton (Oldbury), Limited, Brentford	3¾

TARVIA.

Bristowe & Co., Limited, London	3¾

HOLLINGBOURNE.—For the construction of a sewer and manholes, for the rural district council. Mr H. M. Apps, sanitary inspector:—

Barden & Head, Maidstone	£83
N. T. Burrows, Maidstone	63
A. Tong, Harrietsham, Kent*	46

PETERBOROUGH.—For the supply of broken granite, granite kerb, and granite channelling, for the corporation.—Mr. J. W. Walshaw, city surveyor.

Broken Granite.—Enderby Granite Company, Leicester. Groby Granite Company, Leicester.

UXBRIDGE.—For the construction of a sewerage scheme, for the rural district council.—Mr. J. W. Harrison, engineer and surveyor:—

W. Jackson, Forest Gate	£1,012
Economic Drainage Company, Limited, London	997
J. C. Turner, Blackwater, Hants	936
E. & E. Iles, Wimbledon	908
T. W. Pedrette, Enfield ..	899
Payne Brothers, Watford	889
G. Wimpey & Co., Hammersmith ..	861
Willis & Powis, Wembley	861
W. Lingwood, junr., Romford	861
Lovell & Sons, Gerrard's Cross, Bucks	855
Langley & Johnson, Slough, Bucks ..	825
W. Wright, Chesham, Bucks ..	814
A. & B. Hanson, Southall, Middlesex	789
	782

UXBRIDGE.—For the erection of a corrugated-iron bathing shed, for the urban district council.—Mr. W. L. Eves, surveyor:—

H. & G. Pratt, Uxbridge	£180
Payne Brothers, Watford	127
J. McManus, Hammersmith	115
Palmer & Co., Merton Abbey	114
L. Aston, Uxbridge	112
J. Wallis & Co., Rickmansworth	110
S. Butler, Chesham	108
Lovell & Sons, Gerrard's Cross	97
W. S. Try, Cowley	85

WANDSWORTH.—For making up part of a road, for the borough council.—Mr. P. Dodd, borough engineer:—

Willis & Powis, £1,546, and 10 per cent. above schedule prices for extras or omissions.

WHITSTABLE.—Accepted for the supply of flints, hoggin, brick rubbish, sand, ballast, crushed flints, tar, cement, tar-macadam and steam rolling, for the urban district council. Mr. F. Laurens, surveyor:—

Finn & Co., Canterbury. Steam roller hire, 2s 6d. per hour; 25s. per day.
Thames Sand and Dredging Company, London. Crushed ballast, 3s. 6d. per ton.
Cremer, Goodenough & Co., Faversham. Flints, 4s. 10d. per yard; hoggin, 3s. 10d. per yard; sand, 4s. per yard; brick rubbish, 3s. 8d. per yard; ballast (Brightlingsea), 4s. 6d. per yard.

WITHAM.—For the supply of granite chippings, for the urban district council.—Mr. W. P. Perkins, surveyor:—

	s. d.
Johnston Brothers, London	16 2
Brookes, Limited, London	15 10
W. Griffiths & Co., London	15 0
Whitwick Granite Company, Leicester	14 11
Lavender & Bateman, Leicester	13 9
Croft Granite, Brick and Concrete Company, Leicester	12 6
Enderby and Stoney Stanton Granite Company, Leicester	12 6
C. Abell, Limited, Atherstone ..	12 3
Jees Hartshill Granite Company, Atherstone*	12 3

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MAY.

7.—Junior Institution of Engineers: Informal Discussion 39 Victoria-street, S.W., 8 p.m.
8.—Institution of Municipal and County Engineers: Meeting at Scarborough.
11.—Society of Engineers: Mr. Arthur H. Baker, WH.SC., B.A., B.SC., on "Some Future Developments in Heating and Ventilation." Institution of Electrical Engineers. 7.30 p.m.
22.—Concrete Institute: Mr. E. A. W. Phillips, M.INST.C.E., on "Lime Concrete in the East." 7.30 p.m.
26.—Institution of Municipal Engineers: Council Meeting in London. 5.30 p.m.
28.—Institution of Municipal and County Engineers: North-Western District Meeting at Northwich.
28.—Royal Sanitary Institute: Meeting at Shrewsbury. Discussion on "The Value of Mechanical Filters in the Purification of Water." 7.30 p.m.
29.—Institution of Municipal and County Engineers: Council Meeting.
29.—Association of Managers of Sewage Disposal Works: Visit to Wimbledon Sewage Works.

JUNE.

4-5.—Institution of Municipal and County Engineers: Scottish District Annual Meeting at Ayr.
11. Royal Sanitary Institute: Discussion on "Co-ordination of Military and Civil Sanitary Services in War-time." Bristol Guildhall.
12.—Institution of Municipal and County Engineers: Meeting at Matlock.
24-26.—Institution of Municipal and County Engineers: Annual General Meeting.
25.—Mr. Herbert Samuel opens the National Road Exhibition.

APPOINTMENTS OPEN.

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ENGINEERING AND SURVEYING ASSISTANT required for period of the war. Good draughtsman, accurate surveyor and leveller, competent to draft specifications, and with experience in bridge work. Preference given to one disqualified for military duty. Salary at the rate of £150 per annum, payable monthly. Write full particulars as to age, experience, and when available to the County Surveyor, County Offices, Derby. (2,556)

BEDDINGTON AND WALLINGTON URBAN DISTRICT COUNCIL.

SURVEYOR.

The above Council invite applications for the appointment of Surveyor to the Urban District. The approximate area of the district is 3,200 acres; rateable value, £120,000; population, 15,300.

The salary will be £300 per annum, and the person appointed must devote the whole of his time to the duties of his office, and not engage in any outside work.

Applicants, who must be over 25 and under 45 years of age, must be thoroughly qualified to undertake all duties in connection with the office of Surveyor to an Urban Authority.

Applications, in candidate's own handwriting, stating age, experience and qualifications, accompanied by copies of not more than three recent testimonials, and endorsed "Surveyor," must reach me not later than 12 noon on Tuesday, 11th May next.

Canvassing in any form is strictly prohibited, and will be deemed a disqualification.

T. BOOTH,
Clerk to the Council.

Council Offices,
Manor-road,
Wallington,
Surrey.
April 28, 1915. (2,558)

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. MAY 14, 1915. No. 1,217.

Minutes of Proceedings.

Sanatoria.

The [illegible] part of the annual report of the Local Government Board for 1913-14, which has recently been issued, deals, among other things, with a variety of questions connected with public health and local administration. Not the least important of the matters discussed under this heading are those concerning the prevention and treatment of tuberculosis. In regard to the provision of new sanatoria, two memoranda have been issued by the board during the year under review. The first of these was concerned with the construction and arrangement of inexpensive buildings for the treatment of cases of tuberculosis, while the second dealt with the considerations to be taken into account in the selection of sites. Both of these useful memoranda were noted in these columns at the time they were issued, and both have been of great assistance to local authorities in the provision of buildings required to meet pressing needs for new accommodation for the residential treatment of tuberculous persons.

The board state that they have found it essential, in expressing an opinion on the merits of a site, to explain that if local opposition is raised it may be necessary for them to hold a public inquiry before coming to a decision on the question of formally approving the purchase of the site or sanctioning a loan for the purchase. Local objections have been raised in a considerable number of cases, and in a few instances pressure has been put on the selling landowner to withdraw from his provisional offer on the ground that injury would be caused by the establishment of a sanatorium on the site in question to the health, amenities, or rateable value of the neighbourhood. In some cases, it seems that a real although unfounded dread of infection has inspired the opposition, especially among some of the less well-instructed persons in the vicinity. In others, motives of monetary interest have predominated. In contrast to this, there have been cases where the community have welcomed the establishment of a sanatorium as likely to lead to a considerable increase in rateable value of the parish in which the institution is to be erected. The board have also received objections in several instances to the establishment of dispensaries in towns, on the ground that the existence of such institutions in the midst of a large population might be prejudicial to the health of the neighbouring community. All objections which have been raised have been carefully considered, but with regard to the fear of infection the board have emphasised the opinions unanimously arrived at by the Departmental Committee on Tuberculosis in their interim report, that "there is no danger of infection being conveyed from the dispensaries to the occupants of neighbouring houses," and, in their final report, that "a properly conducted institution for the treatment of tuberculosis is not a source of danger to the neighbourhood."

In regard to the provision of hospitals, the board point out that it was stated in their last annual report that in many cases they had approved the use of infectious diseases hospitals for the treatment of tuberculosis where they were satisfied that the arrangements for the treatment of acute infectious diseases would remain fairly adequate, and they indicated the conditions on which they had approved of the use of small-pox hospitals for this purpose. In a number of cases during the past year local authorities have been able to free their small-pox hospitals for the treatment of tuberculosis, except in the event of a large epidemic of small-pox, by making suitable provision elsewhere for the treatment of sporadic cases of small-pox occurring in their districts; and, in some instances, in order that a small-pox hospital may be permanently devoted to the treatment of tuberculosis, arrangements have been made by which any cases of small-pox occurring in the district served by the hospital will be treated at some other small-pox [illegible]

An Irish County Surveyor's Ordeal.

We have heard a good deal lately about the position and remuneration of Irish county surveyors. Neither was considered satisfactory by fair-minded people; it was, indeed, quite evident that there was room for considerable improvement in the conditions applying to the employment of these responsible officials. This is a phase of the subject of Irish county surveyorships which calls for and duly receives the sympathy of reasonable people. There would appear to be yet another phase that demands more drastic treatment than mere sympathy, and this is the manner in which county surveyors in Ireland are maligned, browbeaten, insulted, and intimidated by local councillors while engaged in the discharge of their duty. A very glaring instance of this was supplied recently at Ballinasloe—whether it was the urban or the rural council is not clear from the report of the proceedings in the local paper—when the county surveyor, Mr. M. T. Kennedy, appeared and gave his quarterly report on the condition of the local roads. In this he called attention to the growing practice among contractors of tendering only for fancy and easily-maintained roads, and leaving those which were allowed to deteriorate for years in his hands. He declared frankly that he would decline to allow the continuance of such a state of things any longer, and stated that every road must have its contractor or he would be compelled to introduce a direct labour scheme over the whole district. With respect to the quality of the work done, he pointed out that a large number of contractors deferred spreading the materials "till the last minute of the quarter," with the result that sheets of stones that by now should be

incorporated with the whole, within the road surface, are scattered over the road, and will have to be raked off again. He warned contractors that unless they altered their methods they would be regarded as defaulters.

This and the construction of a road as to which it appeared the local contractors were in hopeless disagreement was the signal for some extraordinary, not to say amazing, scenes. The contractors, whose elemental passions appear to be constantly simmering on the surface, had their turn first, and while one appealed to the devil to curse the district road they would ever make again, owing to the manner in which the county surveyor treated them, a second told that official to "go to hell with himself and itself," while yet a third, as we read, "nearly went into hysterics" when he was informed that his account had been reduced owing to his neglect. After this it was the councillors who sought to improve the occasion, and one gentleman in particular, Mr. Lynskey to wit, distinguished himself beyond the others in the fury of his onslaught. Referring to the case of a widow who had had £6 struck off her account, he shouted in the face of the county surveyor, "There is no justice done to her, and, mark my word, the curse of the widow and orphans is on your head to-day," adding, after further frenzied abuse, "and there would not be a God in heaven if you were not made an example of, and you will, and that before long." Mr. Lynskey cursed so loud and so long that one is forcibly reminded of the prelatical maledictions incurred by the jackdaw of Rheims in circumstances of peculiar aggravation. It is only fair to say that Mr. Kennedy met this rhetorical tornado with the outward serenity of a philosopher, but all the same it must be very trying to undergo such a verbal bombardment as he was the victim of upon this occasion. Protection from such unwelcome ordeals might perchance become effective if the county council took steps to indict some of the offenders for making use of threats, which, however contemptible and empty they may seem, are highly offensive to an official who is endeavouring to do his best under very trying and difficult conditions.

* * *

The Drifting Sand Filter.

The chief difficulty in connection with the mechanical filter is in the cleansing of the sand. Inasmuch as the sand has to filter a much larger quantity of water within a given time than is the case with the slow sand filter, its surface becomes clogged more rapidly in proportion and must be cleansed frequently. At such times as the filter becomes inoperative another filter must be used, and time must be taken for cleansing. The *Canadian Engineer* contains a description of a filter designed on a new principle for use at Toronto. By this new principle the surface of the filtering sand body is removed continuously, and is washed and replaced automatically. Thus the upper surface of the filter consists of a stratum of drifting sand which is continuously drawn off, washed, and pumped back into the filter with the raw water. A filter capable of dealing with 500,000 gallons per day was erected at the old West Toronto pumping station recently, and was tested almost continuously for thirty-six days. In this case the raw water is drawn from Humber Bay, in Lake Ontario, by means of a centrifugal pump. The water is delivered, together with a continuous supply of sand (the sand circulating from the filter through a sand washer), to the top of the filter. The filter consists of a vertical cylinder of reinforced concrete, deeper than is usual for mechanical filters. The filtered water is collected at the bottom in small hoppers filled with graded gravel held in place by means of brass screens. At a distance of 2 ft. 6 in. above the underdrain system and all round the circumference of the filter are a series of hopper-headed posts down which the drifting sand and water passes. These run to one ring of pipes, along which the wash water and sand pass to a sand washer or separator.

The notable feature is that this sand washer is attached to the filter supply pipe—the pumping main—immediately over a constriction in the pumping main on the filter side of the pump like the constriction in a Venturi meter. Owing to the well-known fact that the pressure in the constricted pipe is less than elsewhere, and less than in the filter, the difference is sufficient to draw the loose sand charged with dirt out of the filter into and through the sand washer, and thence into the supply pipe, whence it passes again into the filter. The weight of the sand carries it to the bottom of the washer, and thus into the pumping main, but the dirt in suspension in the water escapes from the washer at the top. The whole arrangement is very ingenious, and apparently it is quite effective, as may be judged from the recorded results, and it may well be that we have here the application of a new principle which will lead to considerable economy, for it is apparent that if this filter continues to give good results we have something which will materially lessen the first cost of filter installations, and which should also reduce the running expenses. In addition, it should result in a constant rate of working. Further application of the method will certainly be noted with considerable interest.

* * *

The Scarborough Meeting.

Since the Institution of Municipal and County Engineers last visited Scarborough—some nine years ago—the corporation have embarked on a variety of schemes for the improvement of the town and the attraction of the holiday-maker, and these, in course of time, will doubtless be found to be profitable investments from the point of view of the ratepayers. In the existing circumstances immediate benefits are extremely problematical. In common with other towns on the eastern shores of this country Scarborough appears to be resigned to the inevitable falling-off in the number of its visitors during the coming "season," but it may be expected that the bombardment of December last will not be without its compensations providing, as it has done, a number of new "show places" which will not fail to interest the visitor to the town in days to come. At all events, the meeting of the Institution of Municipal and County Engineers, which was held in the town on Saturday, was of peculiar interest. It was devoted almost entirely to inspections of new works and visits to a number of the points which suffered as a result of the German raid. To the municipal engineers of sea coast towns in particular the meeting must have been one of the very greatest interest and value, Scarborough having to face what seem to be almost insurmountable difficulties owing to the erosion of the coast that is continually going on.

The paper read by Mr. Harry Smith, ASSOC.M. INST.C.E., the borough engineer, dealt with the subject of "Catering for the Wants of the Holiday-maker," and will be found in another column. As a matter of policy the corporation have limited themselves to providing the necessary buildings, fittings and furniture for all musical and theatrical entertainments, and have then leased them to experienced caterers, the leases containing clauses designed to safeguard the character and nature of the performances given. In regard to games, on the other hand, the council have run them entirely under municipal management and control. Mr. Smith gave descriptions and details concerning the Alexandra Gardens, Peasholm Park, Peasholm Undercliff and South Cliff Gardens, and also in relation to the new bathing

pool. There can be no doubt that sea bathing is a most important item in the programme of the holiday maker at any modern seaside resort, and that the question of the provision of modern bathing pools in the case of artificial pools in which the pastime may be indulged with safety will have to be faced in many places. Scarborough has given an excellent lead in this respect, the scheme prepared by Mr. Smith providing for a pool of oval shape extending along the shore for 350 ft. and seawards for 190 ft. The work of construction was commenced in 1913, and is now rapidly nearing completion. Altogether, those who were able to be present at the meeting spent a most interesting and instructive day.

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British Fire Prevention Committee's War Emergency Work.

Particulars have been furnished us of the war emergency work done by the British Fire Prevention Committee during the first nine months of the war. The committee's Special Fire Survey Force of honorary surveyors have surveyed in detail some 500 establishments taken over for war emergency work. The character and extent of these establishments varied, but often included extensive groups of buildings. In each case the hon. surveyors' reports, which are prepared on special lines and accompanied by sketch plans, serve as a basis for the detailed written reports by the authorities subsequently prepared at the committee's London headquarters. The committee's War Enquiry Office has dealt with numerous technical enquiries. This work sometimes included matters of a highly technical character for the authorities, and at other times the ordinary enquiries of members of the public. The committee's Warning Service embraces the preparation and issue of a large number of public "fire warnings" disseminated by the committee in the form of posters, notices, circulars issued by technical societies. The issue of these posters involved not only a careful distribution with directions and advice, but also involved, as a rule, an extensive correspondence on technical points. Practical hints regarding the posters have also been issued for application by the Executive of the British Fire Prevention Committee. Hon. surveyors, Special Fire Survey Force, appointed by the committee, and comprising experienced officers and firemen, are brought into such a form as to make 200 inspections with the necessary appliances, readily available for mobilisation at a moment's notice, day or night. Calls upon this force have so far only been made to a moderate extent for fire patrols. The whole of the complex work arising out of the above has been carried out by the hon. officers of the committee and a small clerical staff without materially interfering with the routine work of the organisation. In the conduct of this war emergency work the committee met with considerable encouragement from the authorities, the various offices and corporations concerned having frequently expressed their appreciation of the services rendered.

Heating and Ventilating.

The twin sciences of heating and ventilation formed the subject of a paper of great value and interest which was read by Mr. A. H. Barker, M.Sc., at the last meeting of the Society of Engineers. Many of the difficulties which confront the engineer in connection with these problems are due to the personal idiosyncrasies of the occupants of the room or building with which he is dealing, and to that extent are virtually insurmountable. All that the engineer can reasonably be asked to do is to produce and control certain specified conditions. This in itself is a serious engineering problem, and the primary object of Mr. Barker's paper was to show that it is capable of investigation upon exact scientific lines. The questions to be determined are complex. Thus, efficient ventilation depends not only upon the introduction into a building of a calculated volume of air per hour, but also upon a correct understanding of the distribution of air currents, while the problem of heating is complicated by the essential distinction between convected and radiant heat. In the latter connection Mr. Barker pointed out most clearly the fallacy of attempting to measure the warmth of a room from the point of view of the occupants by means of an ordinary thermometer for taking the temperature of the air immediately surrounding it, and explained his original conception of "radiant temperature." This may be defined as the temperature which a thermometer would register if there were no air in the room at all, or, in other words, a sort of mean of the temperature of the surrounding walls.

The instruments devised by Mr. Barker for measuring this "radiant temperature" and for determining the air temperature are of a very ingenious character, and his experiments go to bear out Dr. Leonard Hill's theory that, physiologically speaking, the chemical composition of air has within wide limits no effect whatever on the human organism. A further important point in connection with ventilation is to determine the effect of the presence in air of dust in considerable quantities, and a necessary preliminary to any such investigation is to be able to ascertain with some degree of accuracy how many particles of dust in fact exist in a particular sample of air. Mr. Barker gave an interesting description of the Aitken dust counter, invented for this purpose—an instrument based upon the principle of measuring off a certain minute sample of air and diluting it largely with a measured quantity of pure and dustless air. There can be no doubt that there is considerable need for the investigation of problems connected with heating and ventilation on scientific lines, and the work accomplished by Mr. Barker and described in his paper forms a valuable contribution to the progress of these important branches of engineering practice.

A Prize Design.

On another page in this issue will be found the drawings and description of the design for the lay-out of a park and recreation ground which was awarded the first prize in a competition recently organised by the Council of the Institution of Municipal and County Engineers. The successful design was the joint work of Mr. W. H. Price, of the City Engineer's Office, Birmingham, and Mr. A. J. Price, of the Borough Engineer's Office, Eccles, who are to be congratulated on a work which bears the marks of thoroughness, boldness, and originality. The area to be dealt with amounted to some 240 acres, so that there was ample space to provide for a variety of sports, games, and other attractions, and of this the designers have taken the fullest advantage. Absolute freedom of treatment was restricted by the conditions of the competition, which provided that a main avenue and stream should run diagonally across the site, intersecting each other at the centre. The successful design deals with this limitation in a masterly way, the whole scheme being dominated by these main features. The provision of a stadium large enough to accommodate from 120,000 to 150,000 persons is a bold feature, while a plot of 20 acres is provided for cricket, football, and polo, with a large pavilion to accommodate the various clubs using the ground. The idea of the competition was an excellent one, and the award of the prize is abundantly justified by the excellence of the successful design.

Design for the Lay-out of a Park and Recreation Ground.

By W. HENRY PRICE, City Engineer's Office, Birmingham, and ALFRED J. PRICE, ASSOC.M.INST.C.E., Borough Engineer's Office, Eccles.

[Awarded First Prize under the Institution of Municipal and County Engineers' Premium Scheme, 1913-14.]

In the design accompanying this description an effort has been made to provide a lay-out for a park and recreation ground which will not only embrace and preserve the best natural features of the site, but will also meet the new conditions called for by the great popularity of all outdoor sports, and the more intellectual forms of recreation in which the naturalist, botanist, art student, scientist, littérateur, or music lover may join.

The main avenue and stream, which, by the conditions of the competition, run diagonally across the site, intersecting each other at the centre, dominate the whole design, and the various roads, gardens and sports grounds are arranged so as to fit in conveniently, and harmonise, as far as possible, with the lay-out of the main avenue and stream.

The main avenue is 80 ft. wide, and has two lines of roads, each 30 ft. wide, divided by a central 20-ft. plot of flower beds, and bounded on each side by a 30-ft. grass plot, and a 20-ft. footpath, shaded by a double line of lime trees, as shown on the section.

Two secondary circular roads, of the same radius and 40 ft. wide, skirt the edges of the park, meeting tangentially at the central circus and clock tower, and with the connecting 40-ft. roads give convenient access to the park by the subsidiary gate entrances.

There is also a 40-ft. road on the north side of the lake, and these roads, which are essentially carriage drives, and the carriageways in the main avenue, are to be laid with tar-macadam, this being the most suitable material for the light motor traffic which has practically superseded horse traffic.

Tar-macadam is also desirable from the hygienic and economic point of view, as it protects pedestrians from the dust nuisance, and is more durable than the gravel of which the narrower roads and walks are formed.

The stream, which at the north-east angle of the park is narrow and irregular, gradually widens out at the centre of the park to a width of 100 ft., and passes under the central circus by a double line of watercourses which are culverted. These streams emerge at the centre of the road, forming a circular ornamental basin practically surrounding the clock tower, and then passing by another double line of culverts to the south side of the circus, emptying into the boating lake of about 12 acres.

This lake will, to a great extent, follow the natural contour of the ground, and will have a depth varying from 18 in. at the sides to 3 ft. in the middle. The excavated material will be useful for forming islands and mounds and undulations in the woods and shrubberies enclosing the lake. The bottom of the lake is to be concreted for about 10 yds. from the edge, and puddled for the rest of the site, if required.

A waterfall is formed on the upper part of the stream near the botanical gardens, and a weir, to hold the lake up to the required level, is constructed at the south-west portion of the stream near the lower part of the lake.

Open-air baths and covered swimming and slipper baths for ladies and gentlemen are formed on the banks of the lake, and a boat-house, with landing-stage, terrace and café, are also located on the north side of the lake.

The park is surrounded by clumps of forest trees and shrubs, and the stream and lake are also enclosed with woods, which not only add to the picturesqueness of the stream, but also provide shady walks and glades and shelter from sun or wild weather.

Ornamental flower gardens are formed near the bandstand, museum, cricket pavilion and palm-house, and botanical gardens for tropical and other rare plants, with suitable glass-houses, pergola, trellis work and roseries are located to the north of the stream and clock tower.

A palm-house and ornamental gardens, in which a sundial and lily pond are provided, are placed to the south-east of the lake.

Zoological gardens adjoin the botanical gardens, and are arranged with open-air enclosures for the animals to roam about freely, the dens, or lairs, being formed in the rockwork under the hill. A bear pit, with access from the open-air enclosures and lairs, a monkey-house, aviary, aquarium and reptile-house are also provided.

A sunk bandstand is located to the north of the clock tower, and a concert hall, which may be used by the band in bad weather, or for classical or other concerts, is provided as part of the museum and art gallery buildings.

The provision of art galleries and museums in public parks has been largely adopted of late years, and the study of art and science has an additional interest amid such pleasant surroundings.

In a park of 240 acres it is not only possible, but desirable, to make provision for the majority of the recognised forms of sport and athletics. If we are to take an honourable position in the Olympic games, or encourage and help the Boy-Scout and other similar movements, it is necessary that we should have an Olympic centre, which will enable our athletes of the younger generation to emulate the deeds of our immediate ancestors.

The stadium is large enough to accommodate from 120,000 to 150,000 persons, which, in these days of Final Football Cup-ties, is not too large a size. It provides two large covered seated stands, with uncovered standing accommodation at the ends. A gymnasium, which can also be used for dressing or drill purposes, adjoins the northern stand. A swimming pond for swimming and diving contests, a concrete cycle track, a cinder track for running, with turf enclosure for running or football are provided in the stadium. The covered stands contain refreshment-rooms, club-rooms, dressing-rooms and lavatories, and the lower portions of the open stands could be utilised for garages, refreshments, stores or conveniences.

Four public and two club bowling greens, eighteen public and twelve club tennis courts, together with croquet lawns, are provided.

A plot of 20 acres is provided for cricket, football and polo, with a large pavilion to accommodate the various clubs using the ground.

A clock and observation tower with electric lift is placed in the central circus, which is easily seen from all parts of the park, and which forms the focal point of various roads, and makes a pleasing vista from both ends of the main avenue and lake.

Boys' and girls' playgrounds, in which would be placed swings, parallel bars, and the usual simple gymnastic apparatus found in these grounds, with shelters, &c., are provided, together with a paddling pool with guard rail in the lake for the younger children.

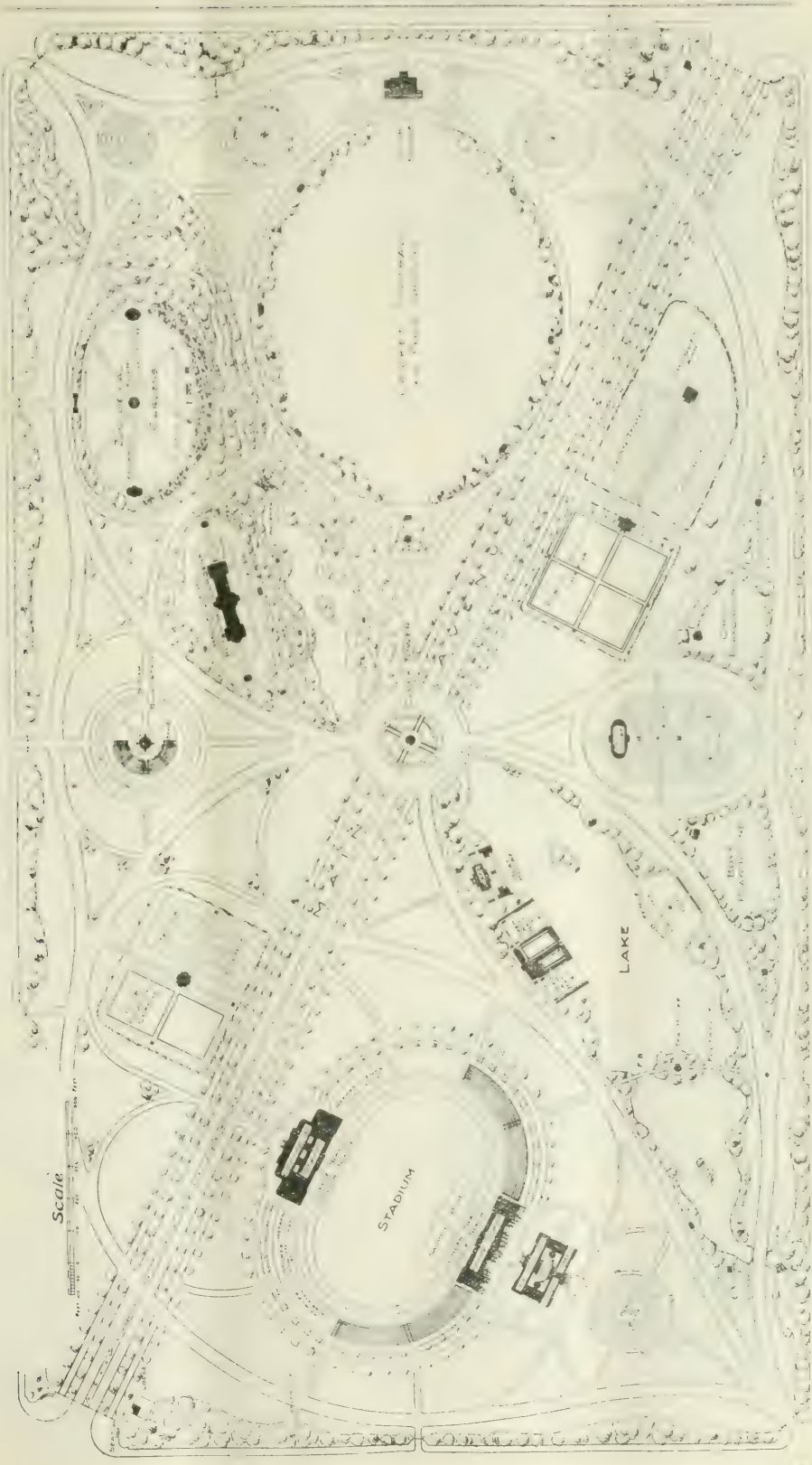
A number of shelters are placed at suitable points in the park, and the sanitary conveniences are usually screened by shrubberies. Besides the café at the boat-house and refreshment-room at the stadium, a tea-house is provided on the largest island at the south end of the lake.

Two park-keepers' lodges are built at the entrances to the main avenues, and it would, in . . . days of Suffragette outrages, be advisable to provide living accommodation for some of the park attendants in the cricket and tennis pavilions, boat-house, baths, tea-houses, stadium and art galleries.

The park entrances have wrought-iron gates, with stone piers of a suitable architectural character, and the smaller gates and railings would harmonise with them.

The detail drawings, though only drawn to the small scale of 20 ft. to an inch, are sufficiently clear to indicate the architectural character of the buildings, and the engineering and landscape details. While an attempt has been made to provide in the art gallery, museum, clock tower and bandstand building of a classic character suitable for the purpose they serve, the stadium, cricket pavilion, boat-house, and other buildings have been designed in a somewhat quieter and more modern style of architecture.

The domes on the concert hall, clock tower and



Design of Messrs. W. H. & Alfred J. Price for a Park and Recreation Ground.

bandstand are formed in concrete and covered with copper, and the palm-house and conservatories in the botanical gardens are of glass with steel framework, which are materials, perhaps, not allowing of the best or purest style, but are still of the most useful character for the purpose they serve. The designs are sufficiently varied to avoid monotony, and it is hoped that they do not offend any of the recognised canons of architectural taste.

The question of cost cannot be ignored, even in a competition such as this, and while an effort has been made to avoid anything of a cheap and shoddy character, yet extravagance in the buildings or layout has been carefully avoided as far as possible, and it is hoped that a design for a park and recreation ground worthy of a large and important town has been provided.

HEAVY TRAFFIC.

COUNTY COUNCILS ASSOCIATION'S PROPOSALS.

The following are the heads of evidence to be given on behalf of the County Councils Association before the Departmental Committee on Locomotives and Heavy Motors (Damage to Roads), so far as such evidence is admitted by the committee:—

(1) LOCOMOTIVES AND HEAVY MOTORS.

(*a*) It should be rendered impossible for the same vehicle to be registered at the same time as a heavy locomotive and a heavy motor car.

(*b*) Means should be provided by which the drivers both of heavy locomotives and of heavy motor cars can be made aware of vehicles coming up behind by placing a man at the rear, or by a reflector or otherwise.

(2) HEAVY LOCOMOTIVES.

(*a*) The size and weight of locomotives and trailers, and of the weights to be carried by the latter, should be restricted. The weight upon any one axle should be regulated according to diameter of the wheel and width of tyre, and the ratio of weights to the diameter and width of tyre should in no case exceed that which it is recommended should be adopted for the Heavy Motor Car Order.

(*b*) The weight of a traction engine should be defined as the gross load upon the road, including full supply of water, fuel, &c., such gross load to be ascertained and certified by the county or county borough council, who should issue a plate indicating such weight for affixing to the engine.

(*c*) As the Heavy Motor Car Order prohibits projecting diagonal cross-bars on driving wheels, and narrow bands round front wheels of heavy motors, and these vehicles have been proved to work satisfactorily, similar restrictions should be applied to traction engines.

(*d*) The use of a safety-chain coupling should be required in addition to the ordinary draw-bar and an adequate brake.

(*e*) It should be provided that the county surveyor shall be notified seventy-two hours prior to the traversing of any roads in his county by an engine or engines hauling an indivisible article exceeding 16 tons in weight, and that he shall forthwith notify the district surveyors concerned.

(*f*) County and county borough councils should be given power by by-law to regulate or prohibit the use of locomotives on highways when under repair or upon the break-up of a frost, and all other road authorities should be authorised to take proceedings for the enforcement of such by-laws when made.

(*g*) Drivers should be obliged to be licensed under conditions identical with those imposed upon heavy motors.

(*h*) Annual licence fees should be fixed at, say, not less than £20, to be identical throughout the kingdom, the proceeds to be distributed among road authorities on an equitable basis.

(*i*) Any locomotive habitually let out for hire should not be an agricultural locomotive within the meaning of the Act.

(*j*) The daily travelling fee should be fixed at 10s., and it should be provided that no locomotive weighing more than 14 tons shall be used on the highways of any county or county borough in which it is not licensed unless the owner thereof has first obtained the consent of the licensing authority for such county or county borough or their surveyor.

(3) HEAVY MOTOR CAR.

(*a*) In determining the weight of a car should be provided that the weight unladen should be the maximum gross weight upon the road when in full working order, including full supply of water, fuel, accumulators, &c.

(*b*) The regulations with regard to the weights to be carried on all classes of vehicles should be amended, such weights being based on considerations of width and type of tyres, diameter of wheels and speed. The unit of 840 lb. per inch width of tyre of a 3-ft. diameter wheel used in the Heavy Motor Car Order, 1904, to arrive at the axle weight permissible, is excessive, and should be reduced to 616 lb. per inch, increasing 1 cwt. per additional foot in diameter of wheel, as in present Order. This would make the weight per inch very similar to that permitted in the heaviest traction engines by the Highways and Locomotives Act, 1878.

NOTE.—Whereas the Local Government Board's circular letter of December 28, 1904 (second paragraph, page 2), assumes that "two-thirds of the load may ordinarily be expected to be carried on the axle to which the driving power is directly applied," it is undoubtedly a fact that makers of heavy motors now construct them so that quite three-fourths of the weight is upon the back axle (a reference to advertisements in trade journals makes this abundantly clear), and therefore the registered axle weight, itself excessive, is constantly exceeded.

(*c*) It should be required that every application for the registration or licensing of a heavy motor car be accompanied by a statutory declaration of its weight.

(*d*) Power should be given to any registering authority to weigh any car on any available weighing machine within 2 miles of the spot where the car is stopped.

(*e*) Power should be given to road authorities to prevent heavy motor cars and other light locomotives stopping on bridges to take in water.

(*f*) An adequate licence fee, identical throughout the kingdom, should be payable in respect of heavy motor cars, the proceeds to be distributed among road authorities on an equitable basis.

(4) TRACKLESS TROLLEYS AND MOTOR OMNIBUSES.

(*a*) The proprietors of all trackless trolleys or motor omnibuses should be liable to contribute towards the maintenance of the roads over which they run.

(*b*) Power should be given to road authorities to regulate the running of such vehicles over their roads.

(5) EXTRAORDINARY TRAFFIC.

(*a*) Power should be given to a highway authority which has reason to believe that damage may be done to a highway by extraordinary traffic to apply to justices or the county court to prohibit such traffic until the persons responsible give sufficient security to cover such possible damage as, in the opinion of the Court, may be done, and the road authority should have power to require the amount of security to be increased from time to time where the traffic extends over a considerable period.

(*b*) All disputed claims for damage for extraordinary traffic in England, Wales and Scotland should come before a special tribunal (whose decision should be final) to be appointed in each case by the Road Board, and to consist of two qualified engineers and a legal representative.

London and Lancashire Fire Insurance Company.—The annual report of the London and Lancashire Fire Insurance Company, Limited, shows a successful year's working. The nett realised profit in the fire department was £146,033, in the accident department £80,150, and in the marine department £22,573—an aggregate of £248,756. A sum of £180,300 is placed to reserve, which has now reached the handsome total of £3,466,344. The total security to policy-holders now amounts to no less than £6,107,594.

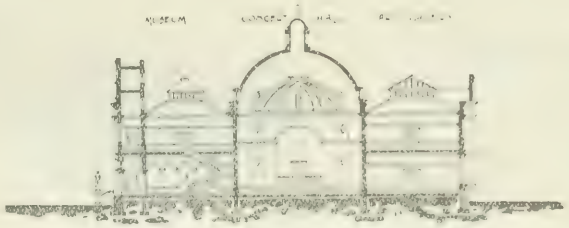
Protection of Contractors.—In the House of Commons, on the 6th inst., Sir Alfred Mond asked the Prime Minister whether he could see his way to cause regulations to be issued under the provisions of the Defence of the Realm Consolidation Act, 1914, relieving any person or firm of legal proceedings when, having both Government and civil contracts, preference was given to Government contracts at the risk of breaking the civil contracts. The Prime Minister said regulations would not be effective for the purpose suggested. The Defence of the Realm (Amendment) No. 2 Act, which was passed on March 16th last, already gave effect to the proposal of his hon. friend to some extent. Any extension of the relief thereby granted would be difficult to refuse, and could only be given by a further Act of Parliament.

Scale

Section through Swimming Baths

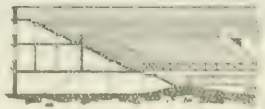
Clock Tower

Elevations to Boathouse and Cafe

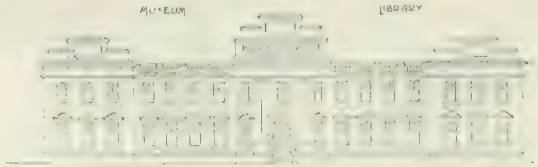


Section through Museum, Concert Hall &c.

Grand Stand. Swimming Pool



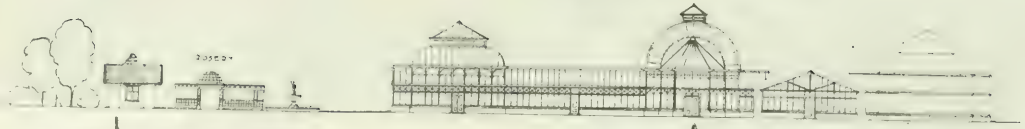
Open Stand



Front Elevation to Museum and Library

Front Elevation to Stadium, Grand Stand

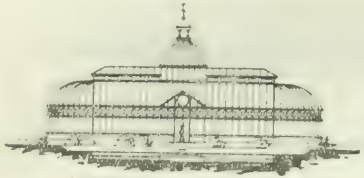
DESIGN FOR A PARK AND RECREATION GROUND. DETAILS.



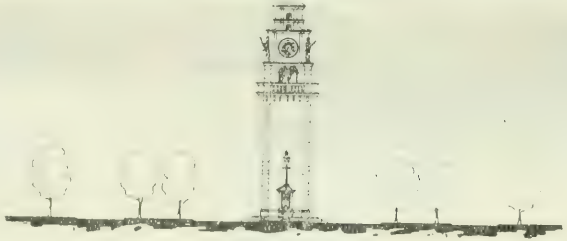
Shelter and Pergola

Botanic Gardens

Zoological Gardens



Palmhouse and Lily Pond

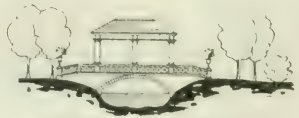


Main Avenue

Footbridge and Tea House

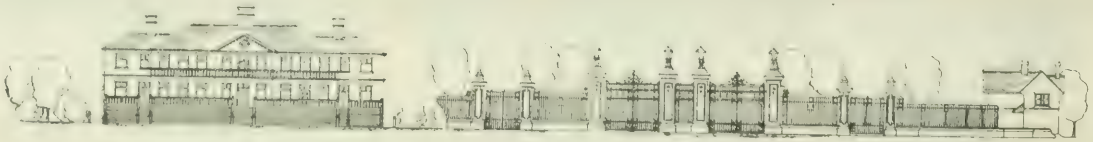
Shelter in Playground

Sunk Bandstand



Footbridge and Shelter

Bowl House



Cricket Pavilion

Park Gates and Entrance Lodge

Design for a Park and Recreation Ground: Details.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Has the *Car* any official authority for stating in the issue of the 28th ulto. that the County Surveyors' Society, in dealing with the question of heavy traffic on roads, "quite realises that the vast industry of automobilism must receive no harmful check, and that it is to be paid rather than to the vehicular traffic that attention needs be paid"? If this statement is authoritative, shall we not all be glad that this society has taken such a broad and proper view of the subject?

* * * *

Is it not rather depressing to see so many strong able-bodied chauffeurs of private motor cars in this country, when we know so much they are needed in the Government's ordinary purposes of order to assist this country in defending us against our vindictive enemy? Is it the fault of the men themselves or of their employers? And what can be done to [illegible] to the fact that this is a war on which our very existence depends? Was not that early cry of "Business as Usual" rather detrimental to our patriotism? Has it not already been proved to have been very premature and unnecessary?

* * * *

Was not the recent collapse of a reinforced concrete building at Bury, in Lancashire, a sad blow at this form of construction, and a possible example which can be used by those who have hitherto looked with some disfavour on this "innovation," as it is even now called by them? Is it not to be hoped and expected that careful investigations will show that there were some special causes for this failure, which might have arisen even in quite another form of construction, so that the employment of reinforced concrete in this case cannot be condemned?

* * * *

Is it a fact that wearing a man before murdering him does not constitute murder? Are the murderers of the innocent [illegible] on board the "Lusitania" to be absolved from their fiendish crime because they said they were going to do it? Does not premeditation add greatly to the abomination of the offence? When will England rouse itself and punish the [illegible] who can be capable of inventing and carrying out the awful crimes which it is committing?

* * * *

Is it a compliment to surveyors or not that the "nuts" of society should be now introducing the subject of roads into their conversation? Do we not find that when they are bored with the turn that talk may be taking they suddenly say, "Yes, that's all very well, but what is your opinion of the state of the roads in Patagonia?"

* * * *

Why is it that the council of the Institution of Municipal and County Engineers, after definitely declining to take part in the road conference which is to be held in June under the auspices of the County Councils Association, have now issued a circular, signed by their secretary, inviting members of the institution to take part in this conference? Why should not the council have agreed to this course at first? And what change has occurred to make them now alter the decision at which they had previously arrived?

* * * *

Has not the Royal Automobile Club shown us, by its eminently practical actions during the war, that a club can be not only a source of social intercourse, but a most useful and powerful adjunct to the resources of a nation? Does not the recent annual report prove that a club can, in time of urgency, act promptly and usefully? And should not this be an example to other clubs that have done nothing, so far, to justify their existence in time of war?

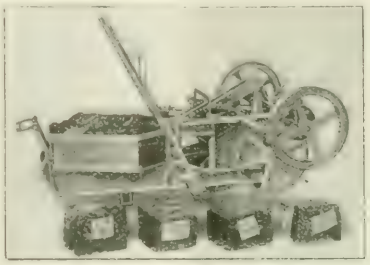
* * * *

Now that it is an established fact that the *Pediculus vestimenti*, or louse, which harbours itself in flannel shirts of dirty people, is the chief cause of typhus fever, will not the following story from the trenches be of interest? One Tommy said to another, both being Cockneys, "Bill, have you got any lices about you?" "No," said Bill, "I had a bath yesterday and a clean shirt." "You silly," said the inquirer, "I didn't mean louse lices, but boot lices!" Does not the charm of this story rest in the fact that it is probably true?

THE "CAMCO" SHEET METAL SCRAP PACKING PRESS.

The accumulation of scrap metal, and particularly old tin cans, sorted out from household and other refuse, is a problem that has long confronted the municipal engineer, but there are many towns throughout the country the authorities of which have yet to realise that this "waste" is one that, for a very moderate outlay, can be turned to very profitable account.

Loose or in bulk, the material referred to is a drug on the market, but suitably bushelled or baled, ready for the smelter, and in a form and density that practice has proved to be most suitable for reduction, it immediately becomes valuable. An efficient means of doing this would seem to be provided by the "Camco" sheet metal scrap packing press, which has been brought to our notice by the Canadian-American Machinery Company, Limited, 8 Bouverie-street, Fleet-street, London, E.C., and the operation



of which is so simple a matter that it requires the attention of only one person, and—what is more important—but little driving power.

The accompanying illustration is a fair representation of the machine when the top is closed down, as is the case when in the act of pressing, or rather bushelling or blocking, which is its work, and not merely baling. As to how well it does its work can be seen by the reader looking at the bushels or blocks as shown in the foreground of the illustration. There is shown its work in the various kinds of scrap which the machine is built to handle, each block being labelled as to what kind of scrap it contains. One is scrap shearing from stove pipe works, one scrap from punchings in making curry combs, one the various ordinary die and punch scrap, and one of old fruit and vegetable tin cans of various sizes. The "Camco" will pack lathe cuttings and metal working machinery chips and cuttings.

As seen by the illustration, the packer is self-contained, so that it can easily be placed anywhere, calling for a floor space of some 5 by 8 ft. only. It is provided with tight and loose pulley, so as to be run from the line shaft such as is usually used in scrap-iron yards, or in mill scrap-iron sheds, to furnish power to run scrap shears, or to be run from a line shaft in the plant where used. It is also equipped with friction clutches, which place it under full control of the operator, who can instantly start and stop it at will, independent of the source of power.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

Southend Town Planning. It is understood that the Local Government Board have given authority to the Corporation of Southend-on-Sea to prepare a town planning scheme under the Housing, Town Planning, &c., Act, 1909, in respect of an area of about 62 acres forming part of the Chalkwell estate within the county borough.

The Greater Swansea Scheme.—The Swansea Corporation have received the draft order consenting to the Greater Swansea scheme. The borough will now be one of the largest in the country, being increased by four times its size to a total of over 24,000 acres. Among the districts added is Mumbles. The population is increased by 33,000 to a total of 153,000, and the rateable value now approaches £750,000.

Institution of Municipal and County Engineers.

MEETING AT SCARBOROUGH.

Last Saturday's meeting of the Institution of Municipal and County Engineers was one full of interest to those who took part in it. In addition to the very considerable number of improvement works which the borough engineer, Mr. H. W. Smith, was able to show, the visitors were afforded the opportunity of viewing some of the damage wrought by the German battleships on the occasion of their flying visit to the famous health resort in December last. At 10 o'clock the members assembled in the town hall, where they were accorded a hearty welcome by the mayor, Mr. C. C. Graham. A bare half an hour was devoted to business, and the remainder of the time before lunch was occupied by an examination of improvements at the spa, beach bungalows, gardens on the South Cliff, and a bathing pool which is in course of construction —all these works being situated in the South Bay. In the afternoon the Castle Hill, which, it will be remembered, received special attention at the hands of the German gunners, was visited. The Alexandra Gardens and Peasholm Park were afterwards seen, the beach bungalows and bathing establishment in the North Bay being subsequently inspected. On their return to the town hall the members were entertained to tea by the mayor. At the opening proceedings in the morning the chair was occupied by Mr. J. S. Pickering, the president, and the company included Messrs. A. Beaumont (Yorks, E.R.), F. C. Beaumont (Driffield), J. H. Drew (Wath-upon-Dearne), S. Dyer (Bridlington Rural), H. B. Foster (Leeds), W. Fowlds (Keighley), C. F. Hodgson (Otley), J. H. Iveson (Scarborough Rural), J. D. Kennedy (Retford), F. O. Kirby (Doncaster), C. Lund (Cleckheaton), S. M. Mason (Grimsby), F. Massie (Wakefield), W. Millhouse (Scarborough), E. Picker (Beverley), H. Richardson (Scarborough), Leslie Roseveare (South Shields), A. J. Rousell (Whitby), J. A. Settle (Bury), J. E. Silcock (Westminster), H. W. Smith (Scarborough), F. W. Spier (York), W. J. Steel (Newcastle-on-Tyne, district chairman), J. P. Wakeford (Wakefield, hon. district secretary), W. J. Warburton (Hornsea), R. E. Webster (Loftus), B. J. Wormleighton (Loftus). The visitors attending the meeting were the mayor (Mr. C. C. Graham), Alderman Pirie, Councillor White, Councillor Boyce, Alderman G. Thornton and Mr. G. H. Miers.

In welcoming the members the MAYOR (Mr. C. C. Graham) said he hoped the day, besides being an interesting one to them from a professional point of view, would also not be without some element, at all events, of pleasure. It would not be easy to overrate the duties and the responsibilities that were attached to their profession. They were directly and immediately responsible for those very necessary arrangements in the towns which the average individual took for granted, but which so very largely affected the general health and welfare. They were responsible for planning and carrying out new urban areas, and the arrangement of those which had become old, inconvenient or obsolete. Beyond that they were responsible for the proper condition of the roads and streets of the town and country districts, while they were also closely connected with the matters of sanitation and lighting. Another matter which concerned them was the provision of open spaces, and it was to the latter aspect of their work that their attention was to be particularly drawn in the paper that was to be presented by their esteemed and capable borough engineer, Mr. Smith. Scarborough owed its popularity as a health resort mainly to the natural beauties both of the town and the surrounding district. They would get some idea that day of the efforts that had been made to beautify the cliffs and make them more permanent. Scarborough, they would find, had extensive and very beautiful gardens along the coast. But, while Nature had done so much to render Scarborough beautiful, the forces of Nature, erosion and denudation, were constantly going on, and presented great difficulties which had to be overcome. He hoped they would approve of the way in which these difficulties were being overcome. He was sure they would, at all events, find great interest in the work that was proceeding.

Acknowledging the welcome, the PRESIDENT (Mr. J. S. Pickering) said that they knew from past experience that they would receive a very hearty reception in Scarborough, and the kindly words to which his Worship had given expression only bore out their anticipations. That was the third occasion on which the institution had met there. The first meeting took place in 1892, when Mr. Joseph Petch was the borough engineer, and the second was held some nine years ago, when they were received by their esteemed confrère the present borough engineer. The comparatively small attendance that day was not due to any want of appreciation of the invitation that had been extended to their members; he need hardly say the reason was the great crisis through which the country was passing. Many of their members were serving their country, and others had their office staffs so depleted that it was impossible for them to attend. None, he was sure, had absented themselves owing to the fear of a repetition of the diabolical act of last December. They all felt that seaside towns ought not to be made to suffer through people absenting themselves from them at the present time, and he thought they could best show their sympathy with Scarborough in the great calamity which had overtaken the town by taking the first opportunity of participating in the great advantages and benefits to be derived from the Queen of Watering Places. The Mayor had hoped that their round of visits would prove highly instructive and interesting. Some few years ago they had the pleasure of inspecting the new Marine-drive, and they were glad to be able to congratulate Scarborough on the successful completion of that undertaking. They were also pleased to know that the great engineering difficulties had been overcome, mainly by the skill and ability of their borough engineer. He thought as a town they should be proud of possessing one of the finest promenades and drives to be seen in any part of the kingdom. They were also looking forward to their visits to the many attractions made for the benefit of visitors. The descriptive paper prepared by Mr. Smith was in itself sufficient evidence of the progressive policy of the council. Scarborough could boast of possessing amenities unrivalled by any other health resort in the kingdom. As municipal engineers engaged in work both utilitarian and ornamental, these visits were to them of great service, and he believed they also conferred a benefit on the towns they represented.

Following the announcement of the receipt of apologies for non-attendance from Messrs. W. T. Lancashire (Leeds), W. Welburn (Middleton) and J. W. Dudley Robinson (the secretary), the subjoined paper was presented to the meeting:—

CATERING FOR THE WANTS OF THE HOLIDAY MAKER.

By HARRY W. SMITH, ASSOC.M.INST.C.E.,
Borough Engineer, Scarborough.

[Mr. Smith, after serving his articles with a Bournemouth architect, entered the office of the borough surveyor of that town under the late Mr. G. R. Andrews. Subsequently he acted as assistant in the same office under Mr. F. W. Lacey, M.INST.C.E., and was appointed to his present position in 1897.]

If any apology is needed for the title of this paper as being of interest to only a small section of the members of our institution, the author must plead in justification that the subject forms a very important branch of the work of those of us whose lot is cast in the pleasure resorts of this country, and it is his intention, within the limits of this paper, to give a brief description of some of the works coming under this heading which have been carried out in Scarborough since the last meeting of the institution in 1906.

The ancient history of the borough has already been given in a previous paper, and the author does not propose to repeat it, but will merely quote current statistics.

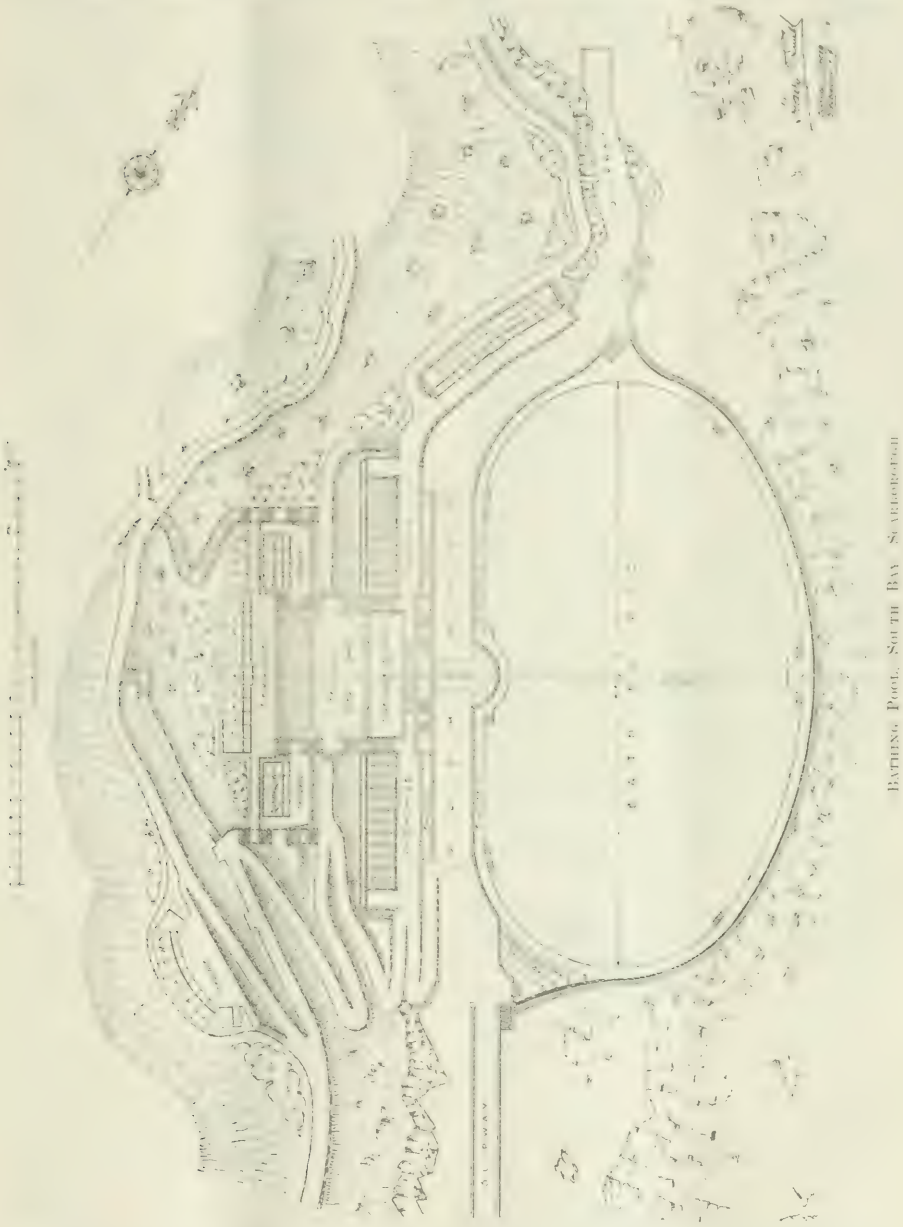
The area of the borough is 2,902a. 1r. 13p., its population at the last census was 37,201, it is now estimated at 37,889, and its rateable value is £245,626.

It is a moot point as to how far a municipality is justified in entering into competition with private enterprse in catering for the needs of the holiday maker; in many branches, unless expert advice is sought and retained, financial loss is pretty certain; but, on the other hand, there is much to be said for a municipality being in a position to safeguard and control certain sections of its amusements; there is,

moreover, the added advantage that when financial [illegible] set and maintained.

The policy adopted in Scarborough with respect to amusements, &c., provided in the parks and pleasure grounds is to provide the necessary buildings, fittings and furniture for all musical and theatrical entertainments, leasing them to experienced caterers, with protective clauses safeguarding the character and nature of the performances given; but as to games, of amusements, the town is rapidly recovering lost ground, and the results have been so encouraging as to spur her on to fresh endeavours, and the author confidently hopes that when next the institution [illegible] much, if not more, to show them in the way of holiday attractions than has been accomplished during the past eight years.

To the great majority of visitors to our coast towns the sea is the premier attraction, and it is a sound



BATHING POOL, SOUTH BAY, SCARBOROUGH.

to retain and run them municipally. This policy experience has proved to be entirely satisfactory.

Results in Scarborough have shown that a progressive policy in respect of the provision of entertainment and amusement for the holiday maker is amply justified. Scarborough, as a pleasure resort, has, in common with many of the older seaside towns, suffered in the change in habits of the people and the competition of foreign travel. To-day, however, due to the enterprise of the town council in the provision policy to centre the holiday amusements as near the sea front as possible. This points to the wisdom of the municipality of a seaside town acquiring land wherever possible along its frontage. Out of a total sea frontage of 4½ miles, Scarborough either owns or leases some 3¼ miles, and it is mainly upon the land so acquired that Scarborough's latest parks and pleasure grounds and places of amusement have been laid out and constructed, and of which it is the intention of the author to give a brief description.

The area of the land in the borough devoted to parks and pleasure grounds is 186 acres, of which 55 acres have been added since the last visit of the institution. The cost of upkeep, interest and repayment of loans for purchase and development entails a charge upon the rates of 7·2d. in the £ annually. Although none of the pleasure grounds are of a very extensive area, they are extremely varied in character, and those situated on the undercliff here furnished many interesting engineering problems.

To proceed with a description of the recent additions.

ALEXANDRA GARDENS

These gardens, which are situated on the cliff top in the North Bay, are 4¾ acres in extent, and were laid out in 1909, the land having been purchased some years previously. The site was so exposed and windswept that it was impossible for trees, shrubs, or flowers to live, and to overcome this difficulty, embankments of earth have been thrown up to deflect the wind. This has enabled a complete transformation to be effected, and these gardens now vie in floral display with any other in the town.

It was originally intended to devote the whole of the level portion of the gardens to the games of bowls and tennis, but on their completion they appeared to be so well adapted for the holding of entertainments that one of the tennis lawns was given up for the purpose, an area of a little under an acre in extent.

For two years open-air entertainments by a concert party and bands were carried out in these grounds, with varying success, the takings fluctuating with the weather.

Various temporary devices were tried in the way of sheltering the audiences, none of which were satisfactory, and in 1909 the author laid before the council a scheme for the erection of a glass pavilion to seat about 1,000 people, at an estimated cost of £3,000, one side of which was to be capable of being opened out, to admit of a portion of the audience being in the open-air in fine weather. This scheme was adopted by the council, but met with most strenuous opposition on the part of the ratepayers. The Local Government Board, after a lengthy inquiry, sanctioned the loan, and the building was erected in three months, and was opened in July, 1910. It has since proved to be one of the most remunerative undertakings the council have embarked upon, so much so that in 1912 a further addition was made to the building of 500 seats. It cannot be said that the housing of the audience partly inside and partly outside was altogether satisfactory in practice, the hall was nearly always closed, and this feature, since the addition, is now practically abandoned.

The council let the building by tender, furnished complete, to an entertainment caterer; they maintain the floral display, which is a feature of the building, but the tenant provides everything else.

There are two bowling greens in the gardens, one crown and the other flat, and three tennis courts, which are extremely popular and yield a good revenue. A pavilion for the use of bowlers and tennis players is provided.

Overlooking the bowling greens is a combined public shelter and cafe, the latter being let on lease. Lavatories for both sexes are also provided.

The total cost of laying out these gardens was as follows:

Floral hall, seats in arcaded roads, including toilet blocks	£14,900
Shelter and café	540
Bowlers' pavilion	160
Laying out grounds	4,000
	£19,700
Cost of upkeep, loan charges, including purchase of land, in the year 1913 was	£1,206
Which the receipts from entertainments and rents were	£1,110

PEASHOLM PARK.

Peasholm Park, which adjoins Alexandra Gardens, was laid out in the winter of 1911-12, partly on land which was originally purchased for allotments and partly on land purchased from H.M. Commissioners of Woods and Forests. The site has historic associations, it forming part of the ancient Manor of Northstead. During the course of laying out the foundations of the old manor house were bared, and proved to be of a very extensive character. Unfortunately, they could not all be preserved, but careful records were taken of everything found.

The land, as purchased, consisted of a swampy meadow with a small stream running through it, surrounded on three sides by high grounds. At the sea end of this meadow was a large mound rising some 43 ft. from the level of the same. The situation suggested the formation of a lake, with the mound as an island, and by cutting away one side of the mound, and damming up one end of the ground and excavating, an ornamental lake of 4½ acres in extent has been formed, which is the outstanding feature of the park. The island has been connected up with the mainland by an ornamental bridge of a span of 45 ft. Smaller islands have been formed to act as refuges for water fowl.

At the western end of the park the stream which feeds the lake runs through a very pretty ravine, a portion of which is included in the park. The stream at this point has been dammed up and a chain of smaller lakes formed, each connected by a waterfall.

The lake is furnished with a fleet of boats and Indian canoes, twenty in all, and, although so near to the sea, boating has proved to be extremely popular and remunerative.

The surroundings of the lake have been embellished with shrubberies, lawns and flower beds, while the lake itself is well stocked with coarse fish and furnished with ornamental waterfowl of various species. An aviary for British and foreign birds has been built, and is much appreciated.

The bridges, boat-house, shelter and landing stage, which are of wood, have been designed in the Japanese manner, and it is the intention of the author to add further features of this character. A large café, shelter and lavatories are now in the course of construction.

Peasholm Park may be said to be only in its infancy, for the council are at the present moment taking steps, under the Town Planning Act, and by purchase from H.M. Commissioners of Woods and Forests, to acquire the extensive ravine lying to the west.

The cost of laying out Peasholm Park, including bridges and buildings, &c., was	£8,025
The cost of upkeep and loan charges, including purchase of land, for the year 1913 was	817
The revenue from boating was	950

PEASHOLM UNDERCLIFF.

The Peasholm Undercliff, as its name implies, is a cliff side, situated in the North Bay, immediately adjoining the north end of the Royal Albert-drive, was purchased from H.M. Commissioners of Woods and Forests at the same time as the land for Peasholm Park, and is 4½ acres in extent.

Running along the foot of the cliff was the corporation main sewer outfall, which, to some extent, acted as a protection to it from the inroads of the sea, but the cliff itself was in a very bad state, due to the presence of numerous land springs.

Before any portion of the undercliff could be utilised for the erection of buildings, extensive drainage operations had to be carried out. The strata of the cliff consisted of shale, overlaid by boulder clay, with pockets of drift sand. The system of drainage employed consisted of deep main drains taken down into the shale, with spur drains to intercept subsoil water. The pipes used were glazed sanitary pipes, laid with open joints, and all trenches were filled up with rubble stone from the beach.

A promenade (for foot traffic only) has been formed, 25 ft. in width, for the whole length of the undercliff, 13·5 ft. above ordnance datum, the sea wall supporting the same also acting as a protection to the outfall sewer. This wall was built with concrete blocks, 2 ft. by 1 ft. by 1 ft., with a bull-nosed coping; it has a stepped face; the space behind the blocks and the sewer was filled in with mass concrete.

Immediately behind the promenade the cliff side [illegible] buildings in connection with the improvement are erected.

Perhaps the most popular feature of this scheme has been the provision of the beach bungalows, of which some forty-six have been erected. These are grouped in blocks and pairs, and each bungalow has a small portion of ground in front of it for its exclusive use; the paths immediately communicating [illegible] the bungalow-holders. No sleeping is allowed in the bungalows, and they are let on annual tenancies at [illegible] small number are retained by the council, which are let for short periods. The dimensions of the smaller

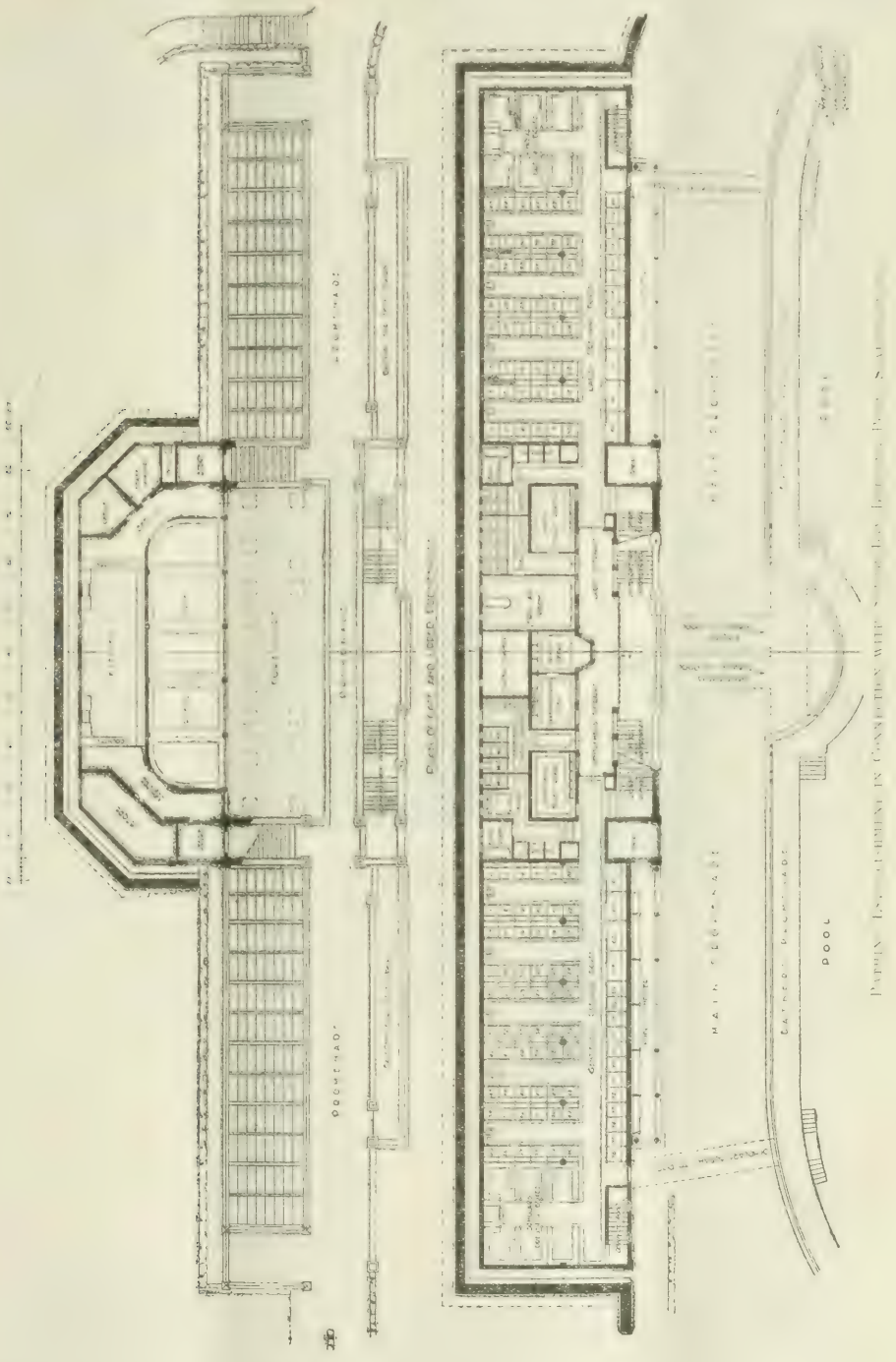
bungalows are 8 ft. by 7 ft. 6 in., with a covered verandah 8 ft. by 4 ft. The larger ones are 15 ft. 3 in. by 8 ft. The fittings consist of a corner cupboard and a folding table, gas is laid on, and water at convenient points. The demand for bungalows is steadily growing, and the council are taking steps to provide more.

The beach bathing establishment consists of twenty bathing-boxes for males and twenty for females, with cold shower baths and lavatory accommodation. This establishment has proved to be very popular for beach bathing, the only drawback being the distance to be traversed by the bather at low tide.

Three public shelters are provided, one being in connection with a café, which is leased to a caterer.

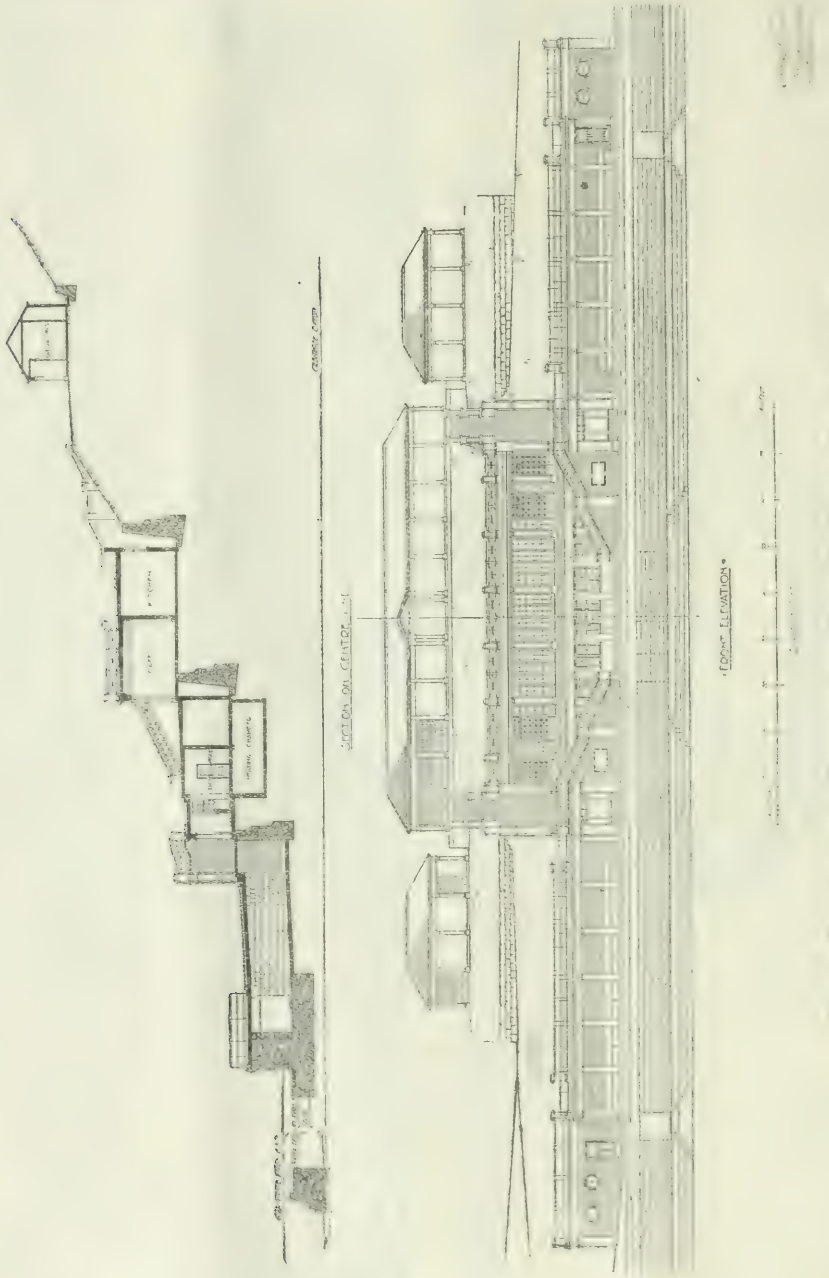
The whole of the buildings (with the exception of the lavatory block) in connection with this improvement are of wooden framing, lined on the outside with weather-boarding and inside with match-boarding; the roofs have been covered with Poilite slating.

The average cost of the smaller bungalows is £28, the larger ones £50, exclusive of preparation of site.



The author has prepared plans for a bathing pool and establishment on the beach, adjoining this undercliff, of similar character to the one now being constructed in South Bay, and but for the war would have shortly been commenced.

They are 18¾ acres in extent, and until their purchase in 1912 they formed a barrier between the whole of the frontage of the Esplanade on the South Cliff and the beach, to which access could only be obtained at one point by means of a steep flight of steps.



BATHING ESTABLISHMENT IN CONNECTION WITH SOUTH BAY BATHING POOL, SCARBOROUGH.

	£	s.	d.
Total cost of improvement, including purchase of land, was ...	7,876	0	0
The annual cost of upkeep and repayment of loans is £15 was	715	19	9
For the year ended 31st March from all sources was	705	2	1

SOUTH CLIFF GARDENS.

The South Cliff Gardens are situated in the South Bay, and consist of the wooded undercliff lying between the Spa Grounds and the Holbeck Gardens.

A portion of the southern half of the undercliff purchased had been laid out as a private garden some years ago, and some drainage had been carried out; but large areas were in a very bad state, and heavy landslips had taken place, due to the presence of springs. Since the acquisition of the land very heavy sums have already been expended in drainage, the work having been done in sections, and a considerable further expenditure under this head will be required before the cliff can be brought to rest. Drainage work and excavating are now in progress, and members

The Surveyor
And Municipal and County Engineer.

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[illegible] the application [illegible] garden in the making.

A complete scheme of development was prepared by the author for the whole of the land, dealing with the whole area, in which an expenditure of £50,000 or more was foreshadowed, and the work is being carried out in sections extending over a period of years.

A start was made with the northern half of the gardens in August, 1912, and this section is now practically completed.

The strata of the undercliff consists of sandstone rock at the beach level, overlaid by shale and boulder clay, and the general system of drainage adopted consisted of deep main drains of open-jointed stoneware pipes, with all trenches filled up to the surface with rubble, and spur drains taken to intercept the subsoil water, the whole discharging into a cast-iron outfall pipe laid across the beach.

A series of winding footpaths, connecting the esplanade with the sands, have been constructed, and it is now possible to reach the sands without a step. The height of the cliff at this point is about 175 ft., and the length of main footpath is over ½ mile. The heaviest gradient on this path is 1 in 13; the paths are tar-paved, the surface being sprinkled with broken red brick for effect. Short cuts, with concrete and rustic steps, are provided at convenient points.

The formation of these footpaths entailed considerable excavating, and it was necessary to construct retaining walls at the back of most of them. These walls are formed of sandstone, quarried on the beach, and they have been [illegible] herbaceous.

Early in 1914 the [illegible] of the southern half of the gardens was commenced, mainly consisting of the linking up of the completed [illegible] half with the Holbeck Gardens, and the formation of the rose garden.

The rose garden is of segmental form, and the central feature is a stone-kerbed lily pond of geometrical design, surrounding a pedestal upon which is a graceful lead figure of "Mercury."

At either end of the gardens rises a series of terraces, with stone retaining walls and piers finished with vases; flights of steps lead up to pergola shelters of classic design, overlooking the garden.

The garden is sheltered on the sea side by a trellis of larch posts and rails, filled with riven oak lattice pales.

The gardens are furnished with teak seats of ornamental design, which, together with the statue of "Mercury," were a gift from a townsman.

BATHING POOL.

Sea bathing is an important item in the programme of the holiday maker, and the question of better and more up-to-date provision of facilities has been under the consideration of the Scarborough Town Council for some years past. As far back as 1900 they applied for and obtained Parliamentary power to construct bathing pools upon the sea shore, and to make a charge for the same, with borrowing power to the extent of £8,000, repayable in forty years.

Ancient prints of Scarborough show the "ark on wheels," with which we are all familiar, and which to-day holds sway on the sands. Its long vogue has no doubt been due to the fact of its capacity to follow the receding tide, and saving the bather a long walk over the sands, which of necessity occurs when any permanent structure is erected on the sea shore. This drawback, as before stated, is felt in connection with the present establishment in the North Bay.

The safety of the bather is of the utmost importance to a seaside resort, and in Scarborough at the present time three safety boats, with two men in each, are continually on duty daily during bathing hours.

The advantages of a bathing pool are manifold, and, briefly, may be summed up as follows:—

(*a*) A reduction of the risk of sea bathing to a minimum.

(*b*) Bathing is possible at times when, owing to rough seas, it would be risky to do so.

(*c*) More commodious accommodation and comfort can be provided for the bather than is possible in a bathing van.

(*d*) Facilities for the holding of swimming galas and carnivals, with the attendant revenue to be obtained therefrom.

Since 1900 the author has prepared a number of schemes for pools in various sites in the North and South Bays, but until the purchase of the South Cliff Gardens nothing came of them. The site now chosen —in a small bay on the foreshore near the southern end of the gardens—is an ideal one for the purpose.

The scheme prepared by the author provides for a pool extending along the shore 350 ft., and seawards 190 ft., varying in depth from about 2 ft. to 7 ft. It is oval in shape, the landward side being flat. A commencement was made with the work of constructing the pool during the summer of 1913, and it is rapidly nearing completion.

The foundation of the pool wall rests on the sandstone rock forming the sea bed. The outer wall is 9 ft. 6 in. thick at its base, and 6 ft. 6 in. on the top, finished on the inside with a bull-nosed coping and on the outside with a dwarf rounded coping 10 in. high to act as a kerb. The wall will serve as a bathers' promenade, and will be used to seat spectators during galas.

The range of tides varies between neaps and springs from 4·5 ft. to 10·5 ft. above ordnance datum, and the level of the top of the wall has been fixed at 7 ft. above ordnance datum, so that, with the exception of calm-water neap tides, fresh water will flow over into the pool at high water.

Five outlets, 15 in. in diameter, fitted with screw-down valves, are provided for emptying the pool.

Steps to enable bathers to enter and leave the water will be provided, and also platforms fitted with diving boards, &c.

The wall for a short distance from the shore was constructed of an outer skin of concrete blocks, 2 ft. by 1 ft. by 1 ft., header and stretcher courses, alternately filled in with concrete in mass. The seaward section is constructed of mass concrete in two courses. Wooden boxes, 10 ft. by 9 ft. by 3 ft. 6 in., and 10 ft. by 7 ft. 2 in. by 3 ft. 4 in., were employed, a box being filled each tide and left for two days before striking. Rock from the beach and old iron rails were used as a tie between the two courses. The outer face of the wall was 3 to 1, with a hearting of 6 to 1, and rock from the beach being used as plumbs. The coping and kerb to the wall is formed of blocks.

On the landward side of the pool, 17 ft. above ordnance datum, is a promenade for the public, 25 ft. in width, descending at either end to the beach by slipways and steps.

The establishment in connection with the pool is now in course of erection.

The accommodation provided consists of seventy-six boxes for males and sixty-one for females, with separate accommodation at either end for the use of schools. Hot water and cold showers, baths, first-aid room in case of accidents, ample lavatory accommodation for the bathers and the public, attendants' room, &c., are also provided for. Access to the pool is by means of steps, and four subways under the promenade.

On the top of a portion of the establishment will

be a cafe, with terraces, promenades, and seating accommodation for spectators, overlooking the pool, access to which will be gained by flights of steps from the main promenade.

A separate block for the purpose of a laundry and pumping plant for conveying the sewage from the establishment to the sewers on the Esplanade will be provided for.

Space for the buildings has been excavated out of the cliff side, retaining walls on each floor level will be necessary, and for these reinforced concrete will be employed.

The buildings will be of brick, with patent stone dressings. The flat roofs will be of reinforced concrete covered with asphalt. The walls of the lavatories, showers and corridors will be lined with glazed tiling.

On a third terrace, overlooking the pool, will be erected blocks of bungalows of a similar type to those already described.

A series of winding walks, connecting the pool with the existing main walks in the gardens and leading to the Esplanade, are now in the course of construction, and a low-level promenade, connecting up the bungalows in the northern half of the gardens, will shortly be put in hand.

As the works of the development of the South Cliff Gardens are not yet completed, exact costs cannot be given, and the following figures show the approximate or estimated cost of the works already carried out or of those now in hand:—

	£	s.	d.
Laying out northern section of the gardens—			
Beach shelter	820	3	8
Bungalows, lavatories, cafe and shelter.	3,813	0	0
Footpaths—excavating and draining ...	5,320	0	0
Extension of beach shelter	629	16	4
Laying out southern section of the gardens—			
Drainage, excavating and laying out of rose gardens, shelters, footpaths, &c.	3,412	0	0
Bathing pool and promenade, bathing establishment, laundry block, café and bungalows	13,200	0	0
Laying out of cliff adjacent to bathing establishment	4,500	0	0
Total expenditure on works completed, &c.	£31,695	0	0

(To be concluded.)

KILLED IN ACTION.

The Water Committee of the Birmingham Corporation received a report last week of the death in action of Private W. A. E. Owen, of the 1st Company of the 8th Battalion (T.F.) of the Royal Warwickshire Regiment. Prior to the war Private Owen was in the service of the water department at the Broad-street office, and the news of his death on Sunday, April 25th, was communicated to Mr. L. [illegible], the secretary of the water department, in a letter from Private F. J. Bent, who was also employed by the department.

Private William Kent, 9th Battalion Royal Scots, of the county sanitary inspector's office, Ayr, was killed in action in France on April 23rd.

City of London National Guard Engineers' Unit.—On Saturday afternoon, May 8th, the Post Office Engineering Volunteer Training Corps and the National Guard Engineers' Unit took part in a joint parade near Lancaster-gate, Hyde Park, afterwards marching to the Powder Magazine, Kensington Gardens. Arrived at this point, the Post Office Engineers, under their Commandant, Captain Gunton, commenced the installation of field telegraph and telephone systems between the Marble Arch and the Round Pond; while the National Guard Engineers, under the command of Mr. W. Noble Twelvetrees, Acting-Adjutant, made a survey for the construction of a trestle bridge to be erected for use by the Post Office Corps, and subsequently acted as an attacking party whose object was to pursue and capture one of the field telegraph companies operating in Hyde Park. The bridge mentioned is now in course of construction by the Engineers' Unit, at the headquarters of the London Brigade R.G.A., Offord-road, Barnsbury, where drills and engineering practice take place on Tuesday, Wednesday and Thursday evenings.

FUTURE DEVELOPMENTS IN HEATING AND VENTILATION.

On Tuesday, at a meeting of the Society of Engineers, Mr. A. H. Barker, M.I.Mech.E., B.A., B.Sc., read a paper on the above subject. The twin sciences of heating and ventilation, he said, have received but little attention in their scientific aspects. The complexity of the factors that go to make up a given result, and the difficulty of defining in terms of exact science what that result is or should be, are reasons for lack of progress in the science of the subject, and added to this one has to take into account the variability of human physiology and psychology as an essential part of the problem.

Physiologists are not even agreed upon what was a healthy temperature for human beings to live in. The heating and ventilating engineer aimed at producing comfort, but is baffled by the fact that a man is comfortable only when he thinks he is. Air which, judged by chemical analysis, is impure may feel fresh and sweet, and *vice versâ*.

The only legitimate function of the engineer is to produce and control specified movements of air and other effects, while it should be the duty of the physiologist and hygienist to specify what are healthy and comfortable conditions. In connection with heating, the expression "temperature of a room" is generally understood to mean the reading of a thermometer suspended in the room; but this reading does not necessarily indicate the temperature of the surrounding air, or form a reliable guide to the feelings of the occupants of the room. The air temperature, the radiant temperature, the quantity of convected heat, and the quantity of radiant heat must all be determined; but first the relation between the thermometer reading, the air temperature, and the radiant temperature must be determined.

The freshness of air in a building depends on keeping the air temperature relatively low, and the radiant temperature high. The chemical composition of the air has, within wide limits, no effect on the human organism; whereas its temperature and humidity are very important.

The paper described experiments made at University College, and the apparatus used in connection with them, and discussed briefly some problems which it is sought to solve experimentally.

CONCRETE INSTITUTE.

ANNUAL GENERAL MEETING.

The sixth annual general meeting of the Concrete Institute was held at Denison House, Westminster, S.W., on Thursday, the 6th inst.

Prof. Henry Adams, M.INST.C.E., the president, submitted the annual report and balance-sheet, which were adopted by the meeting.

It was announced that, as the result of the annual election of members of council, the following had been elected:—

Mr. R. H. Harry Stanger, ASSOC.M.INST.C.E., A.M.I.MECH.E., F.C.S.

Mr. D. B. Butler, ASSOC.M.INST.C.E., F.C.S.

Dr. J. S. Owens, B.A., M.D., ASSOC.M.INST.C.E., F.R.G.S., F.G.S.

Mr. W. G. Perkins, district surveyor for Holborn.

Mr. Ewart S. Andrews, B.SC.(LOND.).

Mr. J. Ernest Franck, A.R.I.B.A.

Mr. Lewis H. Rugg, ASSOC.M.INST.C.E.

Mr. G. C. Workman, M.S.E.

Mr. J. S. E. De Vesian, M.INST.C.E., M.I.MECH.E.

The president presented the institute's medal to Mr. W. Cyril Cocking (member), for the best paper read during the session 1913-14—namely, that entitled "Calculations and Details for Steel-frame Buildings from the Draughtsman's Standpoint."

The sixty-second ordinary general meeting then followed, when the adjourned discussion on Mr. Osborn C. Hill's paper, entitled "The London Building Acts with some Suggested Amendments," was resumed.

The last ordinary general meeting of the session will be held on Thursday, May 20th, at 7.30 p.m., at Denison House, Westminster, when Mr. E. A. W. Phillips, M.INST.C.E., M.C.I., will read a paper entitled "Lime Concrete in the East."

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride Lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

[illegible] invited to the following [illegible]

474. Roof Truss. [illegible] end of a [illegible] supported on rubber bearings, [illegible] a load is applied at the [illegible] and further. How would any movement in the truss affect the [illegible] How much is a roof, span [illegible] [illegible]

479. Reservoir Dam. [illegible] and [illegible] of an earth embankment, with core [illegible] a reservoir by 12 ft. using [illegible] each side of [illegible] 2 ft. the embankment to be 12 ft. [illegible] the [illegible] (E. P. M., *Bangor*.)

480. Sewer Survey. [illegible] required to [illegible] of an old brick [illegible] 32 chains [illegible] 100 ft. on a [illegible] [illegible] [illegible] [illegible] How much [illegible] [illegible] what [illegible] [illegible] (W. S. W., *Guildford*.)

481. Testing Materials. [illegible] tests by which we [illegible] measure the [illegible] of [illegible] [illegible] [illegible] which [illegible] [illegible] property. (A. M. I. C. E.)

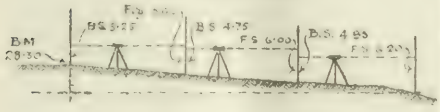
[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

477. Levelling. In a series of levels, if the first back sight read 3·25 on an ordinance bench mark of 28·30, the sum of the back sights be 12·95, and the fore sights 17·20, what will be the ordnance reading of the last fore sight? (E. W. P., *Southampton*.)

Assuming the readings to suit the stated conditions, the elevation of the point upon which the last back sight was taken = 24·05 as shown in the accompanying sketch. If the last reading were

Field Conditions.



Booking.

B.S.	Int.	F.S.	Rise.	Fall.	Height above base.	
28·30		28·30			28·30	O.B.M.
3·25		5·00		1·75	26·55	
4·75		6·00		1·25	25·30	
4·25		6·20		1·25	24·05	
12·25		17·20		4·25		
		12·25				
		5·00				

taken on an O.B.M., and does not coincide with the above, the B.M. may have sunk through subsidence, or may have been marked wrongly. I came across one such in the Tyneside district, which read exactly 1 ft. below what it was marked. (F. N., *Gosport*.)

The difference between the sums of the back and fore sights gives the total rise or fall, according as [illegible] of the back sights is greater or less than the sum of the fore sights respectively. The rise or fall, added to or deducted from the ordnance reading of the first back sight, as the case may be, will give the ordnance reading of the last fore sight. In this case the sum of the fore sights exceeds that of the back sights, showing that the total fall exceeds the total rise of the ground levelled. Deducting the [illegible] or 17·20 − 12·95 = 4·25. Therefore it will be seen that the ordnance reading [illegible] = 28·30 − 4·25 = 24·05 (S. P. B., *Leeds*.)

478. Levelling.—It is required to find the difference of level of two pegs on opposite banks of a river, and it is known that the collimation line of the level you have to use is out of adjustment. How would you find the difference of level required? (E. W. P., *Southampton*.)

The line of collimation must be at right angles to the vertical axis of rotation, and therefore parallel to the [illegible] Should [illegible] not be the case the instrument can be tested for this deficiency and adjusted as follows: Select a level piece of [illegible] and drive two pegs [illegible] apart on either side of the level. Having carefully set up the instrument, place a levelling staff on one of the pickets (taking the lower peg first) and read the staff. Turn the telescope through 180 deg., relevel it and read the staff, which should now be placed on the other peg. Drive this peg down until the staff when placed on it gives the same reading as when placed on the first peg. When this has been done set up the instrument about half a chain beyond either peg, level it, and read the staff when placed on each peg. If the instrument is in adjustment then the readings on each peg should be the same, the distances being so short that the error due to refraction is negligible. If the readings on [illegible] the diaphragm screws should be carefully adjusted [illegible] the instrument without making the necessary adjustment, then the correction which it will be necessary to make to the readings on the staff can be determined thus: The routine described above is carried out as before, but the distance between the two pegs must be carefully measured. The instrument having been carefully set up about half a chain beyond either peg, as before, readings are taken on staff when placed over the two pickets and the difference of the readings noted. If i be the angle which the line of collimation makes with the hori[illegible] plane, then

$$\tan i = \frac{\text{Difference of readings on staff}}{\text{Distance apart of pegs}}$$

This determines the angle i. If the reading of the further peg be greater than that of the nearer, then the angle i is an angle of elevation; if the reading of the nearer peg be greater than the reading of the one more remote, then i is an angle of depression. The correction [illegible] to be applied to each reading of the instrument is—

$$D \tan i$$

where i is the angle of elevation when the correction must be subtracted from the reading on the staff; or is the angle of depression, when the correction must be added to the staff reading. D is the distance in feet from the instrument to the station whose level is required.

When determining therefore the difference in level between two pegs with an instrument whose line of collimation requires adjustment of this nature, the method of procedure is to take the levels in the ordinary manner, and also to measure the distance of the instrument from the staff when each reading is taken, applying the necessary correction, taking care to notice whether the latter is positive or negative. (M. T. R.)

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

St. Albans R.D.C. (May 5th. Mr. A. W. Brightmore).—£4,531 for works of sewerage and sewage disposal for the parish of Wheathampstead.—Mr. H. Howard Humphreys, M.Inst.C.E., Westminster, said he was called in by the council to advise on the remodelling of the existing works, and found that the present means of purifying the sewage were quite inadequate, and that in order to bring the works into line with modern requirements it would be necessary to provide practically entirely new plant. There was no public water supply, and the flow of sewage proper was low, but there was a great deal of roof and road water finding its way into the sewers during flood time. A good deal of storm water had been cut off during the last few years, but in all circumstances it seemed unlikely that very much more could be eliminated from the sewers. In these circumstances the new scheme had been designed to treat fully three volumes of sewage calculated at the rate of 15 gallons per head per day, from a population of 3,000 persons. In designing the filters it had been assumed that each square yard would purify 25 gallons for each foot in depth. Upon this assumption the two primary beds and one secondary bed were capable of fully purifying 135,000 gallons per diem—three times the dry-weather flow. The concrete bases of the primary and secondary beds were to be put in of larger diameter than was immediately necessary, so that in the event of an extension being required 22 per cent more square yards could be added for practically the cost of the additional clinker. The existing main sewer would be picked up at the manhole by the entrance gate, and would then join a new sewer from New Marford, and would discharge into a pump well under a new engine-house. Adjoining the pump well a storage tank would be placed, which would come into use only when the pump well was full. It was not intended to make general use of this tank, it having been provided in order to give time to get the pumps working should a sudden storm occur in the absence of the attendant. Further storm water storage would be provided in the two existing sedimentation tanks, which would be altered by the removal of the central division and the putting in of a new floor. Provision had been made for emptying the sewage from the storage tanks back to the pump well when necessary. The surveyor to the council, Mr. H. F. Mence, also gave evidence.

APPLICATIONS FOR LOANS.

Bournemouth T.C.—£3,550 for new roads and pleasure grounds.

Cannock U.D.C.—£386 for works of sewerage.

Lancs C.C.—£11,500 for a small pox hospital at Chadderton.

Loughborough T.C.—£930 for works of road improvement.

Pontefract T.C.—£1,045 for the purpose of street improvement.

Scarborough T.C. £700 for works on the South shore.

LOANS SANCTIONED.

Dundee T.C.—£29,000, supplemental loan for the electricity undertaking.

Exeter T.C.—£6,901 for the improvement of Paul-street.

Gower R.D.C.—£420 for work of road diversion.

Newcastle-on-Tyne T.C.—£1,801 for the provision of workmen's dwellings in the St. Lawrence and Walker-road districts.

Sheffield T.C.—£134,373 for an electricity sub-station and plant at Neepsend power station.

FORTHCOMING INQUIRIES.

MAY. £

17.—**Wotton-under-Edge.** For the provision of a burial ground (Mr. R. H. Pickmell) ... 1,300

18.—**Crompton.** For works of sewage disposal (Mr. W. O. E. Meade-King) ... 2,490

18.—**Ilford.** For rebuilding a bridge (Mr. A. W. Brightmore) 900

19.—**Chapel-en-le-Frith.** For works of water supply (Mr. W. O. E. Meade-King) ... 3,950

20.—**Hawarden.** For the purposes of electric lighting (Mr. H. Shelford Bidwell) ... —

21.—**Manchester.** For the provision of a generating station (Mr. H. Shelford Bidwell) 513,000

21.—**Oswaldtwistle.** For the construction of a new road (Mr. W. O. E. Meade-King) 2,614

COST OF MAIN ROADS.

EXPENDITURE FROM 1903—13.

On the 6th inst., in the House of Commons, Sir John Spear asked the President of the Local Government Board if he would state what was the amount of money expended by local authorities in England and Wales in the maintenance of main roads during each of the last ten years, and what portion of such money was raised from the rates, Imperial taxes, and the Road Board respectively.

Mr. Herbert Samuel: The latest year for which complete figures are available is the year ended March 31, 1913. The following table shows, for the ten years ended on that date, the amounts expended on the maintenance, repair, improvement, and enlargement of main roads (exclusive of expenditure out of loans) by county councils, who are the local authorities liable:—

Financial year.	Expenditure on maintenance, repair, improvement & enlargement of main roads.	Loan charges.	Total.
	£	£	£
1903-4	2,406,754	7,759*	2,414,513
1904-5 ...	2,478,481	8,766*	2,487,247
1905-6 ...	2,529,106	8,906*	2,538,012
1906-7	2,535,399	10,394*	2,545,793
1907-8	2,614,025	10,367	2,624,392
1908-9 ...	2,753,891	16,146	2,755,737
1909-10	2,835,822	16,966	2,852,788
1910-11	3,046,337	22,233	3,068,560
1911-12	3,323,458	33,081	3,356,539
1912-13	3,619,751	38,811	3,658,562

* Loan charges for main roads and other highways, but mostly for main roads

No portion of the proceeds of the local taxation licences, of the grant under the Agricultural Rates Act, 1896, or of the other Exchequer grants is specifically allocated to main road expenditure; but the published local taxation returns for the last few years give estimates of the amounts of that expenditure calculated to have fallen on grants and rates respectively, these estimates being based on the assumption that the benefit of unallocated Exchequer grants is spread evenly over all the branches of expenditure concerned. In regard to the year 1912-13, it was accordingly calculated that, of the abovementioned sum of £3,658,000, £2,298,000 was defrayed out of rates and £748,000 out of grants other than grants from the Road Board. The county councils received in the years 1910-11, 1911-12, and 1912-13 £8,000, £178,000 and £266,000 respectively from the Road Board, but these sums were not entirely limited to grants in respect of main roads.

Bradford Replanning: Competition Awards.—The Bradford Corporation some time ago invited competitive designs for the replanning of the centre of the city, in connection with the new Midland Railway line scheme, and the assessor, Mr. Reginald A. Bloomfield, R.A., on Wednesday gave his award as follows: First prize of £500, Gibson, Skipworth, and Gordon, Old Bond-street, London; second prize of £300, Patrick Abercrombie and Lloyd B. Barnes, School of Architecture, Liverpool; and third prize of £200, Reginald Dann, Crawley, Sussex, and John H. Horniman, Robertson-street, Hastings.

Tees Valley Water Board.—At a recent meeting of the Tees Valley Water Board it was decided to defer until after the war the construction of Conduit No. 10, the estimated cost of which is £47,000. The clerk reported that the Local Government Board had refused to sanction the borrowing of £3,000 for the extension of water mains. The board were on the horns of a dilemma, for if they did not carry out the extension they were under a statutory penalty. Several members said the action of the Local Government Board threatened seriously to cripple business, stop the building trade, and prevent the opening out of new districts, but no action was taken in the matter.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are details of the more important projected works and which particulars appear in the Buildings—Durham, Northumberland, Southampton, Walton, housing and town planning Cardiff, Newcastle-on-Tyne; roads and materials—Durham, Herts, Seaford, Wandsworth; sewerage and sewage disposal—Swinton, Water supply—Aberdeen. Particulars of other projected works will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Altrincham U.D.C.—The question of providing [illegible] receiving attention.

Dewsbury T.C.—The plans for alterations and additions to the hospital at Thornhill have received the sanction of the Local Government Board.

Donegal C.C.—The county surveyor, Mr. J. H. Steadman, has prepared plans for alterations to the county offices at Lifford.

Durham C.C.—It has been agreed to reconstruct [illegible] mated cost of £3,000.—The Education Committee recommend the council to build a new school at Haggerleases, at an estimated cost of £1,095.

Leek T.C.—The Hospital Committee are giving consideration to a scheme for the provision of a hospital.

Llanfyllin R.D.C.—The council have resolved to approach Lord Powis with a view to obtaining the necessary land for the erection of a [illegible] Four Ends, Llangedwyn.

Northumberland C.C.—Plans have been prepared for a school at Ashington, which is estimated to cost £13,800. It is also proposed to build a school at Bedlington, at an estimated cost of £2,450.

Nottingham T.C.—The council are making application to the Local Government Board for a loan of £420 to provide an open-air annexe, accommodating 40 [illegible] for fitting up a dispensary in North Church-street for the treatment of tuberculosis, and carrying out certain works at the Bagthorpe isolation hospital.

Pontefract T.C.—A site has been purchased for the erection of public conveniences and lavatories.

Southampton T.C.—The council have approved the scheme of the waterworks engineer for the erection of a water tower on the Common, at an estimated cost of £14,000.

Surrey C.C.—The widening to 41 ft. of Windows Bridge on the main Portsmouth road has now been completed and the bridge opened to traffic. The contractors were Messrs. Stephen Kavanagh & Co., of Surbiton Hill, and the cost £2,393.

Uckfield R.D.C.—The council have referred to the Isolation Hospital Committee a communication from the East Sussex County Council intimating that it was proposed to make an order constituting a hospital district at Uckfield.

Walsall T.C.—A scheme is being considered for the purchase of a site at Great Barr for the erection, jointly with the West Bromwich Corporation, of a sanatorium, at an estimated cost of £20,000.

West Sussex C.C.—With respect to the proposed reconstruction of Norfolk Bridge, at an estimated cost of £17,000, a communication has been received from the War Office declining to contribute towards the cost, their view being that the liability for the work fell on the county.

HOUSING AND TOWN PLANNING.

Brixham U.D.C.—Negotiations have been completed for the purchase of land for a housing scheme.

Clydebank T.C.—The plans of a number of workmen's dwellings, which it is proposed to erect on a site of 12 acres, have been approved, and the master of works has received instructions to obtain tenders.

Droitwich R.D.C.—The Local Government Board, in response to an application for permission to purchase at once land at Ombersley, Cutnall Green and Snead's Green (although the housing projects for which the land was needed have been postponed until after the war), suggested that an effort should be made to extend the time of option of purchase, and that the schemes should be proceeded with and submitted to the board, so that there would be no avoidable delay in proceeding with the building of the houses as soon as circumstances permitted. The clerk said he thought there would be little difficulty in obtaining a short extension of the option period. The Housing Committee were instructed to proceed with the details of the schemes immediately, the clerk expressing the opinion that if that course were taken he thought the Local Government Board would allow the purchase of the land out of current rates, repayable [illegible]

East Barnet U.D.C.—The council have under consideration schemes, plans, and estimates for the erection of dwellings for the working classes.

Great Ouseburn R.D.C.—The Local Government Board have given their approval to the housing scheme for Boroughbridge, but the work is postponed for the present.

Newcastle-on-Tyne T.C.—A decision was reached last week to develop part of the Walker estate, belonging to the corporation, by providing 688 dwellings, at a capital cost of £117,781.

Swaffham U.D.C.—It has been agreed to submit to the Local Government Board an amended scheme for the erection of six houses.

Westhampnett R.D.C.—The Sanitary Committee have appointed a sub-committee to inspect sites at Eastergate for the erection of workmen's dwellings.

REFUSE COLLECTION AND DISPOSAL.

Horbury U.D.C. The [illegible] the [illegible] the [illegible]

ROADS AND MATERIALS.

Argyllshire C.C.—The surveyor to the Cowal District Committee has received instructions to prepare plans and estimates of several proposed road improvements for presentation to the Road Board.

Bristol T.C.—The city engineer, Mr. L. S. McKenzie, reported last week to the Sanitary Committee that the Local Government Board were now rather in favour of the widening of the road from Shirehampton to Avonmouth, and had asked that the application for the loan should be resubmitted.

Brixham U.D.C.—Tar-spraying is to be carried out [illegible] £1,30.

Bulkington U.D.C.—It has been agreed to purchase a tar-sprayer, at a cost of £40.

Chelmsford T.C.—The Local Government Board having written suggesting the postponement of the work of wood paving Duke-street to the railway station, the loan for which was sanctioned last July, Messrs. W. Griffiths & Co., the contractors, wrote that they were prepared to accept payment, plus 15 per cent for loss of interest, for the actual money paid on account of the contract for wood blocks and reinforcement, and waive all rights in the contract for the execution of the works. As an alternative, they suggested that they should complete the work at once, they agreeing to allow any balance not already borrowed to remain for two years at 5 per cent interest, by which time the war would probably be over. The council have agreed to accept the alternative offer, subject to the consent of the Local Government Board.—The tender of Messrs. Davey & Armitage, Southend, at £652, has been accepted for making up Braemar-avenue.

Crompton U.D.C.—An intimation has been received from the county council that they have sanctioned £819 for special work on roads in the Crompton area.

Dover T.C.—It is proposed to purchase six electrical vehicles for scavenging purposes.

Durham C.C.—The council have approved a recommendation of the Works Committee to proceed with the improvement of the Great North Road between Darlington and Durham. A grant of £24,657 for the work has been made by the Road Board and sanctioned by the Treasury, and application is to be made for a loan from the Board of £78,102, without interest,

for seven years. The council have referred the question of improving the Gateshead-to-Durham section of the North road to a sub-committee, with power to carry out the work, but not before the application to the Road Board for a loan has been made.—Other works to be carried out include the widening of the main road on the hill immediately north of Chester-le-Street, at a cost of £460, exclusive of the purchase of land; the purchase of land to improve a dangerous corner opposite Neville's Cross Hotel; and the paving of the carriageway over Elvet Bridge, Durham, at a cost of £672.—It has been decided to purchase three steam tractors.

Epsom R.D.C.—Application is being made to the Local Government Board for sanction to the taking over and making up under the Private Street Works Act, 1892, of Bridgefield-road, Grove-road and Landseer-road, on the Bridgefield estate, Cheam.

Hazel Grove U.D.C.—The surveyor, Mr. G. S. Doncaster, has received instructions to widen Commercial-road, from the Royal Oak Hotel to Bolton Fold-road.

Herts C.C.—Towards the cost (£17,315) of resurfacing the main road from Watford to Boxmoor it is hoped to receive a grant of £15,583 from the Road Board.

Middlesbrough T.C. It has been agreed to put in hand the widening of Morton-road, from Clairville-road to Highfield.

Perth T.C.—The Works Committee have decided to tar-pave the roads of the city.

Poplar B.C.—The Works Committee have adopted a proposal to lay down creosoted deal paving in part of Roman-road, at an estimated cost of £1,100.

Renfrew C.C.—At the Roads Committee meeting of the Upper District Committee a letter was read from Mr. W. Rees Jeffreys, secretary to the Road Board, stating that during the coming financial year the board propose to make grants towards the cost of road crust improvements which are immediately required, but that, unless special circumstances can be shown, such grants will be on a considerably reduced scale, and will only be made in the case of important roads, the improvement of which cannot properly be postponed. The road surveyor, Mr. Robert Drummond, reported that the letter referred principally to improvements of a permanent nature, such as had recently been carried out on Kilmarnock road; but he thought that the application made by the district committee for a grant to aid the annual tar-spraying, &c., of roads may be held to come under the description of works that cannot be postponed without either public inconvenience or the risk of serious disintegration of the improved crusts already laid down. The committee agreed to adhere to the whole claim already made for grants for road improvements during the ensuing year.

St. Germans R.D.C.—It was reported that only one tender had been received for the reconstruction of Weard-road, St. Stephens. The chairman said the tender received was unreasonable, and he thought the council could resort to direct labour. The surveyor, Mr. H. A. Hosking, was instructed to carry out the work and obtain as much labour as he could.

Seaford U.D.C.—The surveyor, Mr. B. A. Miller, recently had an interview with an officer from the War Office, who inspected the roads and went carefully through the surveyor's specification, and he decided that many roads were to be repaired, and the estimates forwarded to the Road Board. The estimates amount to £8,779.

Stockport T.C.—The borough surveyor, Mr. J. Atkinson, submitted recently a report on a proposed improvement at St. Petersgate, and the Tramways Committee agreed to the suggestion that the tramway rails should be raised and the road completed with granited rock asphalt, subject to the Highways Committee obtaining satisfactory tenders for the work.

Sunderland R.D.C.—The surveyor, Mr. T. Young, has received instructions to prepare plans and estimate of cost for a new road between the villages of Castletown and North Hylton.

Swansea T.C.—Plans have been approved for the construction of new roads at Pentrepoeth.

Wandsworth B.C.—A scheme has been adopted for the improvement of the approach to Wandsworth Bridge, at an estimated cost of £90,000. It is hoped to receive the greater part of the money from the Road Board.

Westhampnett R.D.C.—Road tarring operations are to be carried out at an estimated cost of £200.

Westhoughton U.D.C.—A new steam roller is to be purchased at a cost of £400.

SEWERAGE AND SEWAGE DISPOSAL.

Ballymena U.D.C.—It has been decided to defer the proposed scheme of wholesale substitution of water-closets for privies until the district is provided with a sufficient water supply, and that individual cases of insanitary dwellings be reported to the council and dealt with.

Cumberland C.C. The council have forwarded to the Local Government Board a report by the medical officer of health on the sanitary condition of Longtown, stating that, in his opinion, nothing short of a complete sewerage system for the whole village, the abolition of midden privies, with the substitution of water-closets, and the provision of satisfactory receptacles for house refuse, will ever make the sanitary condition of the district satisfactory. It is understood that the district council have had such a system under consideration, and that they are prepared to consider such a scheme at a more opportune time.

Nottingham T.C.—A small decrease in the number of pail closets in Nottingham is reported in the annual report of the corporation nightsoil department. The number was reduced from 31,084 in 1913 to 32,651 last year. Dry ashbins have increased by 1,645, to 31,600. With the exception of a short time in June or July, when farmers were busy with the harvest, the whole of the nightsoil has been sold.

Paisley T.C.—At this week's meeting it was intimated that a letter had been received from the Secretary for Scotland inquiring if any action had been taken by the council since his letter of February last on the subject of the pollution of the river Clyde by sewage from the burgh. The clerk stated that he had replied to the communication, and explained that in the existing position of affairs the Drainage Committee did not consider themselves justified in proceeding further with the matter at present.

Swindon T.C.—Mr. Midgley Taylor has prepared an amended scheme for the extension of the Rodbourne sewage disposal works, which will be submitted to the Local Government Board in due course.

Whitby R.D.C. It was resolved on Saturday to proceed with the drainage scheme previously authorised on the Mill Seat estate, Goathland.

Whitstable U.D.C.—The council have purchased for £1,604 a site for the purpose of sewage disposal works.

WATER, GAS, AND ELECTRICITY.

Aberdeen T.C.—The corporation last week agreed to apply for a Provisional Order in connection with the scheme for an improved water supply, the estimated cost of which is £500,000.

Aberystwyth T.C.—The council are seeking authority to spend £3,900 upon new waterworks.

Barrow-in-Furness T.C.—A scheme has been adopted for the extension of the electricity main in Abbey-road, at an estimated cost of £725.

Boston R.D.C.—The medical officer, Dr. S. S. Rendall, reporting on the water supply of the district, states that the water cannot at the present time be considered safe to drink. "I have received," he proceeds to state, "many complaints from residents both as regards the quantity and quality of water supplied to them. I should again like to emphasise the fact that a surface water (as at present supplied) can never be an entirely satisfactory one, and I also wish to remind you of the excellent and ample supply of deep well water that exists at Bourne and at Donington."

Bristol T.C.—The Electrical Committee on Tuesday reported that the cost of increasing the supply of feed water at Wapping Electrical Works was £1,744, the borrowing of £1,398 of which had been sanctioned. The excess expenditure of £341 was due to unforeseen circumstances, and they asked for authority to apply for a further loan to that amount. They also recommended the provision of a 6,000 k.w. turbo alternator at these works, at an estimated cost of £26,949, and authority to apply for a loan. The growth of the undertaking necessitated the additional plant. The report was adopted.

Clacton U.D.C.—A tar-dehydrating plant is to be installed at the gasworks, at an estimated cost of £300.

Connah's Quay U.D.C. — The electric lighting scheme has been [illegible] to the urban district.

Coventry T.C. The Electric Lighting Committee has been authorised to effect the extension of the switchboard and cabling at an estimated cost of £870.

Edinburgh T.C. The Electric Lighting Committee have resolved to recommend the council to enter into a contract with the trustees of the late [illegible] for certain works of Parliament, an estimate for the Stirling Bridge Company, Limited, for water [illegible] value of the same £2,000.

Exeter T.C. The Waterworks Committee recommend the city council to provide a new [illegible] and a double pump at the waterworks.

Halifax T.C. It is proposed to re-build the wall and raise the reservoirs at the [illegible] Water Lane Dean at a cost of £1,000.

Kingstown U.D.C. Various schemes are to be prepared for a sewerage system at Kingstown and Glenageary area.

Lisburn U.D.C. A letter has been received from the Local Government Board stating [illegible] with the council's proposal to extend the water supply, at the district rate, that they had given sanction for the preparation of a draft Provisional Order in accordance with the recommendations of their chief engineering inspector, subject to the [illegible] application at once to deal with the extended area, and the omission of all reference to the electricity undertaking, charges on the [illegible] and the Boiling Well [illegible] and Harbour Estate.

Nottingham T.C.—The balance of profit on last year's working of the gas undertaking was £[illegible] of this £45,000 has been paid to the general district rate, £30,000 placed to the general fund, and £10,000 carried forward.

Stafford T.C. The [illegible] part of the gas undertaking for [illegible] and the [illegible] to borrowing £342.

Stepney B.C. The council have received the consent of the Treasury to a loan of £15,000 for electricity extensions for the purposes of war contracts.

Torquay T.C.—The Electric Lighting Committee reported that the Local Government Board had intimated that they were not satisfied that there was any necessity for the purchase of premises on Victoria-parade for new offices and stores, and that if the council proceeded with the purchase they must not look to them for any contribution towards the loan. The expenditure of this kind could not be sanctioned at present. The committee, however, adhered to the proposal for acquiring the premises and instructed the town clerk to proceed with the purchase. The engineer urged that it was imperative that his department should be supplied with temporary offices, and it was decided that the town clerk should negotiate for a temporary tenancy of 11 Beacon-terrace.

West Penwith R.D.C.—It was reported last week that all the wells at Chacewater had been [illegible] and that the new water supply was considered satisfactory.

Wolverhampton T.C. Several extensions of electricity mains are recommended by the Electric Committee.

Woolwich B.C. The Finance Committee recommend the borough council to apply for the sum of £25,000 for the purposes of the electricity undertaking.

MISCELLANEOUS.

Birmingham T.C. The council are to be recommended to purchase another motor ambulance at a cost of £630.

Northallerton U.D.C. The council has decided not to allow the fire brigade to attend fires in the rural areas unless the rural council contribute £35 per annum towards the upkeep of the brigade.

Nottingham T.C.—The council on Monday, in granting a war bonus of 2s. a week to those of its workmen who are earning 30s. a week or less, made an exception in the case of single men of military age. These will get nothing extra.

Sunbury U.D.C.—Increases in wages of 2s. 6d. per week during the continuance of the war have been given to roadmen, and 5s. per week each to the foreman and engine-driver at the sewage works.

PERSONAL.

Mr. A. J. Marshall, borough surveyor of Merthyr, has had his salary increased by £50 a year.

Mr. W. Clark, burgh surveyor of Tayport, has been appointed burgh surveyor of Newport, Fife.

Mr. Fred. Turner, borough engineer of Morley, has had [illegible] increased to £90 per annum.

Mr. Peter Miller has been appointed assistant road [illegible] the Dumbarton County Council, at a salary of £[illegible].

Mr. W. L. Hibberd, surveyor to the Catherington (Hants) Rural District Council, has received an increase of salary.

Mr. [illegible] surveyor to the Rake borough Urban District Council, has been voted an [illegible] of salary.

Mr. James Andrew has been appointed road surveyor to the Dumbarton County Council, at a salary of £350, in succession to Mr. A. Wilson.

Mr. J. Weekes, burgh surveyor of Newport, Fife, has been appointed burgh surveyor, master of works, and sanitary inspector for the burgh of Irvine.

Mr. J. B. Fallowfield, surveyor to the Church Urban District Council, has been appointed engineer at the Gold Coast under the Crown Agents for the Colonies.

Mr. H. Lightfoot, draughtsman in the city engineer's office, Newcastle-upon-Tyne, has been appointed engineering assistant to the Port of London Authority.

Mr. Robert McKellar, assistant sanitary inspector at Wallsend, has been appointed sanitary inspector to the Hebburn Urban District Council, at a salary of £120, rising to £150 a year.

Mr. G. C. Mitchell, assistant borough engineer of [illegible] has been voted £[illegible] in consideration of extra services rendered during the illness of the [illegible] Mr. M. H. [illegible].

Mr. H. V. Lanchester will read a paper entitled "The Evolution of the Architectural Competition," at a meeting of the Royal Institute of British Architects [illegible] Monday next.

Mr. A. W. [illegible] surveyor to the Dumbarton County Council, who has resigned, has been appointed advising road surveyor and consulting engineer to the council, at a salary of £[illegible] per annum.

Mr. F. C. Cook, borough engineer of Nuneaton, who has been gazetted temporary Captain in the Army, and is in command of the 216th (Fortress) Company Royal Engineers, has been granted [illegible] by the town council.

Mr. Waude Thompson, ASSOC.M.INST.C.E., deputy borough engineer and surveyor of Burton-on-Trent, who, as already announced, has been appointed borough surveyor of Mansfield, was recently presented by his colleagues at Burton with a dinner wagon. The presentation was made at the [illegible], Mr. John B. Chapman, and the borough engineer and surveyor of Burton, Mr. G. T. Lynam, in supporting Mr. Chapman's remarks, [illegible] Mr. Thompson's ability as an engineer and sterling character, of which he spoke with confidence from his thirteen years' close acquaintance with him in the public works department. He [illegible] Mr. Thompson [illegible] success in his new sphere, he could not help feeling [illegible].

OBITUARY.

Mr. W. A. Collins, surveyor to the Bridgwater Rural District Council, died on April 17th [illegible] in his [illegible] year.

Mr. H. F. Friederichs, borough electrical engineer of West Hartlepool, [illegible] years, we regret to state, on Sunday last. He was [illegible] years of age, and was [illegible] of Penrose, [illegible] Mr. Friederichs [illegible] West Hartlepool in 1889 as [illegible] A. W. Kaye, [illegible] in connection with the [illegible] of the corporation's electricity undertaking, and when the generating station had been built and the plant laid down, he was appointed borough electrical engineer, a position he had since filled with great ability.

Mr. J. Rush Dixon, M.INST.C.E., borough engineer and surveyor of Woolwich, died, we regret to state, on the 6th inst., as the result of a heart attack. He was only forty-six years of age. He received his

early training at Carlisle, and eventually became an assistant in the city engineer's office there, under Mr. W. Howard-Smith. In 1894 he was appointed engineering assistant at Walsall, and in that capacity had charge of the construction of extensive outfall sewerage works. In 1896 he became deputy surveyor to the old Shoreditch Vestry, and upon the death of the chief surveyor, shortly afterwards, he was appointed his successor. In 1899, upon the passing of the Act establishing the metropolitan borough councils, he was unanimously elected borough engineer and surveyor of Shoreditch, where he remained until 1905, when he succeeded the late Mr. Frank

THE LATE MR. J. RUSH DIXON.

Sumner, M.INST.C.E., as borough engineer and surveyor of Woolwich. In addition to his membership of the Institution of Civil Engineers, Mr. Rush Dixon was a member of the Institution of Municipal and County Engineers. He served for some time on the council of the latter body, and did excellent work for several years in the capacity of hon. secretary of the Metropolitan District of the institution. His loss will be regretted by a wide circle of friends, both in and outside the ranks of the profession. The funeral took place on Tuesday last at Plumstead Cemetery.

Sunday Road Watering in Camberwell.—It was recommended last week, in order that the Sunday watering of the Camberwell roads shall not be discontinued owing to the present shortage of men and horses, that the borough council's permanent workmen should be asked to volunteer their services for the work, pay to be at the rate of time and a half.

FOR OTHER ADVERTISEMENTS
See End of Paper.

WANTED, in the Borough Surveyor's Office Burton-upon-Trent, a General Assistant. Must be good Surveyor, Leveller, and Draughtsman. Salary £100 a year. Synopsis of duties may be obtained from the Borough Surveyor, to whom applications, accompanied by copies of three testimonials, must be sent before the 29th inst. (2,569)

CLERK. — Required, a temporary clerk (not eligible for Army), immediately, for duration of war. Must be expert shorthand writer and typist. Applications, in own handwriting, stating age, experience, and wages required, and accompanied by testimonial from employer, to be sent to the Borough Engineer, Municipal Offices, Cheltenham. (2,568)

BRIDGWATER RURAL DISTRICT COUNCIL.

APPOINTMENT OF HIGHWAY, PLAN AND GENERAL SURVEYOR AND WATER ENGINEER.

Applications are invited for the above position.

Applicants to have had practical experience in Highway Maintenance and Administration, and must be qualified to prepare Plans, Bills of Quantities and Estimates for Sewage, Building, and other schemes, and to supervise and carry through same.

Applicants must be familiar with all matters appertaining to Waterworks undertakings, and to be a capable water engineer.

Salary £250 per annum, rising by annual increments of £25 to a maximum of £325.

The Council will also make a grant of £50 per year to the person appointed for travelling expenses, and he will be expected to provide himself with a motor or motor cycle, and to defray the maintenance thereof, together with the running expenses.

Two Assistants are assigned to the Surveyor's Department, and the person appointed will be permitted to take not more than two pupils.

Applications, in Candidate's own handwriting, endorsed "Highway Surveyor, &c.," and accompanied by copies of not more than three recent testimonials, must be sent to the undersigned not later than Tuesday, 8th June, 1915.

Appointment is subject to the approval of the County Council.

Canvassing will disqualify.

T. M. REED,
Clerk to above Council.

Rural District Council Office,
Bridgwater.
May 12, 1915. (2,570)

CORPORATION OF MADRAS.

SPECIAL WORKS DEPARTMENT.

CONTRACT M & M, No. 22—A.

The Corporation of Madras is prepared to receive Tenders from competent persons willing to enter into a Contract for the Supply and Delivery of Cast-iron Pipes, Special Castings, Sluice Valves, Hydrants, &c. The total weight of the pipes and special castings is about 4,700 tons, the diameters varying from 2½ in. to 42 in.

Forms of Tender prepared by J. W. Madeley, Esq., M.A., M.INST.C.E., M.AM.SOC.C.E., &c., Special Engineer, Corporation of Madras, may be obtained from the undersigned on payment of 10s. each, which will not be returned.

Tenders, accompanied by a deposit in currency notes, or a draft on a Madras Bank of Rs.500, should be sent direct to the President, Corporation of Madras, so as to reach him at or before 12 noon on the 14th day of July, 1915.

The Corporation does not bind itself to accept the lowest or any Tender.

JAMES MANSERGH & SONS,
Agents to the Corporation of Madras.

5 Victoria-street,
Westminster.
May 12, 1915. (2,571)

TILBURY URBAN DISTRICT COUNCIL.

ROAD IMPROVEMENTS.

The above Council invite Tenders for the following:—

Supply only.

10,000 gallons (about) approved Refined Tar complying with the Road Board's Specification, No. 4, for Tar No. 1.

Supply and lay on foundations prepared by the Council (for trial sections).

(1) 1,000 sq. yds. (about) Bituminous-bound Granite (graded).
(2) 1,000 sq. yds. (about) Tarred Slag-macadam.
(3) 1,000 sq. yds. (about) Tar Paving.

Forms of Tender, &c., may be obtained from Mr. S. A. Hill-Willis, ASSOC.M.INST.C.E.I., Engineer and Surveyor to the Council, on and after Wednesday, the 19th May, 1915, on the production of a receipt from the Council's Accountant for a deposit of £2, which will be refunded on the receipt of a *bonâ-fide* Tender.

The Contract will contain the form of Clauses adopted by the Council respecting wages, hours, conditions of labour, &c., which the accepted Contractor will be required to sign.

Sealed Tenders, on the Form and in the envelope provided, addressed to the undersigned, are to be delivered not later than the first post on Monday, the 31st May, 1915.

The Council does not bind itself to accept the lowest or any form of Tender.

(By order)
THO. A. CAPRON,
Clerk to the Council.

Council Offices,
Dock-road,
Tilbury.
May 12, 1915. (2,572)

Asphalt and Its Application in Sanitary Work.*

By NANDY HOSKINS

[illegible] not fully understood.

[illegible] in saying this I do not distinguish too closely between the municipal and the sanitary engineer or the architect. He is called upon to advise and design for all [illegible] munity, and is frequently perplexed as to what material may best meet the requirements in special cases.

NOMENCLATURE.

The subject cannot be even superficially treated without first differentiating between asphalt and bitumen, their allied compounds and their substitutes.

[illegible] recently compiled by Mr. H. Percy Boulnois [illegible] manufacturers and users [illegible] rials.

[illegible] to speak of tar-paving as asphalt, or, maybe, ashfelt, and it is not only "the man in the street." The [illegible] large provincial town where a candidate specified 6 in. of asphalt for a footpath. On pointing out to him [illegible] with, he said that he could not know, as part of his daily duty was to superintend the laying of the stuff for the borough council. Thinking that the council may have discovered a mine in the vicinity, [illegible] tained, and he replied that the council made their own from broken stone and tar.

Without claiming originality, or attempting to criticise the publication just referred to, the following interpretations are intended to apply to this paper:

Asphalt.—A general term applying to any and every description of asphalt or crude bitumen.

Rock Asphalt.—Limestone or sandstone naturally impregnated with bitumen.

Lake Asphalt.—Crude bitumen.

Compressed Asphalt.—Pulverised rock asphalt heated and consolidated under pressure.

Mastic Asphalt.—A preparation of rock asphalt and additional bitumen, with or without an admixture of coarse sand or grit.

Artificial Asphalt.—A mixture of pulverised limestone and grit made plastic with bitumen.

Bitumen.—A mixture of hydrocarbons in a solid or viscous state which are wholly soluble in carbon bisulphide and almost insoluble in alcohol.

Maltha.—Crude bitumen in a semi-fluid condition.

Pitch.—The residuum from the distillation of coal tar, wood tar, &c.

Bituminous Mastic.—Any mixture composed of pulverised stone or grit made plastic with or containing pitch or tar products. . . .

ORIGIN OF BITUMEN.

Many theories have been advanced as to the origin of bitumen in Nature. It is so closely allied to petroleum in composition that the formation of one cannot be considered without reference to the other.

Parkes' Chemical Catechism states "naphtha is a fluid and transparent as water, but when exposed to the air it becomes yellow, and then brown, its consistence is increased, and it passes into petroleum. Petroleum is found native in many countries, and by an exposure to the air becomes mineral tar. Mineral tar is also found native, which, by exposure to the air, passes into mineral pitch and maltha. By further induration this passes into asphaltum, which substance is likewise found native in many parts of the world."

It will be seen, therefore, that to arrive at the formation of bitumen and asphalt we must first consider the origin of naphtha.

The word naphtha is derived from the Persian *naftia*, to oust out; but in this country the word is usually confined to a distillation from coal tar or [illegible]

[illegible] occurs in enormous quantities in some very ancient rocks (silurian and carboniferous), and also in much later deposits (early tertiary), and it is evident from its chemical composition that it is of organic origin. Accumulations of vegetable and animal organic matter which, under certain conditions, would have resulted in peat and finally coal, have, as the result of peculiar circumstances, passed through various stages of decomposition by the influence of what has become known as "marsh gas" bacteria, and been converted into a liquid.

[illegible] PROPERTIES OF BITUMEN.

The island of Trinidad, B.W.I., is noted for the most remarkable deposit. Here, in the south-west portion of the island, is the famous "Pitch Lake," so named by Sir Walter Raleigh, who discovered it in 1595. He noted that the lake contained "abundance of stone pitch, that all the shippes of the world might therewith be laden from thence, and we made trial of it in trimming our shippes, to be most excellent good, and melteth not with the sun as the pitch of Norway."

The lake has many peculiarities. It covers about 100 acres, is roughly circular in shape, probably occupying the crater of an extinct volcano, and is [illegible] In 1887 an attempt was made to determine its depth at the centre by boring, but after sinking to a depth of 135 ft. the tubes had inclined to such an angle that the attempt had to be abandoned. There are several islands having rich vegetation in, or rather on, the lake; these, owing to the motion of the "pitch," are continually changing their position.

Quoting from Chas. Kingsley's description of the lake in his interesting book, "A Christmas in the West Indies," he says: "Conceive a crowd of mushrooms, of all shapes, from 10 ft. to 50 ft. across, close together, side by side, their tops being kept at exactly the same level, their rounded rims being squeezed tight against each other; then conceive water poured on them so as to fill the parting seams, and in the wet season, during which we visited it, to overflow the tops somewhat; thus would each mushroom represent tolerably well one of the innumerable flat asphalt bosses which seem to have sprung up each from a separate centre, while the parting seams would be of much the same shape as those in the asphalt, broad and shallow atop, and rolling downward in a smooth curve, till they are at bottom mere cracks from 2 ft. to 10 ft. deep. Messrs. Wall & Sawkins explain the odd fact clearly and simply. The oil, they say, which the asphalt contains, when it rises, first evaporates in the sun, of course most on the outside of the heap, leaving a tough coat of asphalt which has, generally, no power to unite with the corresponding coat of the next mass. Meanwhile Mr. Manross, an American gentleman, who has written a very clever and interesting account of the lake, seems to have been so far deceived by the curved and squeezed edges of these masses that he attributes to each of them a revolving motion, and supposes that the material is continually passing from the centre to the edges, when it 'rolls under' and rises again in the middle. Certainly the strange stuff looks, at the first glance, as if it were behaving in this way, and certainly also his theory would explain the appearance of sticks and logs in the pitch. They are often several feet in length, and 5 in. or 6 in. in diameter. On reaching the surface they generally assume an upright position, one end being detained in the pitch, while the other is elevated by the lifting of the middle. They may be seen at frequent intervals over the lake, standing up to the height of 2 ft. or even 3 ft. They look like stumps of trees protruding through the pitch, but their parvenu character is curiously betrayed by a ragged cap of pitch which invariably covers the top, and hangs down like hounds' ears on either side."

The lake has been worked under a concession granted by the British Government for some twenty-

* Paper read at a meeting of the Institute of Sanitary Engineers held at Caxton Hall on the 5th inst., Mr. H. Percy Boulnois (past president) in the chair.

seven years, during which period some millions of tons of the material have been exported, the bulk of it going to the United States, but large quantities being shipped to this country by Messrs. Previte & Co., of London.

The crude material is dug from the surface of the lake, and, although several tons may be removed in a single day, within thirty-six hours the excavations are said to refill by the exertion of the natural pressure from below. The material is taken in iron skips to an aerial railway, which conveys it to the sea, some 800 yds. distant, for shipping.

Asphalt is also found beyond the boundary of the lake, especially between the lake and the sea. This is termed land asphalt. It is questionable how it got there, but the supposition is that the lake, at some early date, overflowed its banks. Although the physical properties of the asphalt varies considerably, even in the lake itself, as may be seen by the specimens exhibited, the chemical composition is extremely uniform.

Before the crude asphalt can pass to any of the many uses for which it may be intended it must undergo a process of refining, as it contains some 30 per cent of water besides organic matters which it is necessary to eliminate. This is usually done in tanks about 15 ft. deep filled with coils of 1½-in. pipes about 6 in. apart. The coils carry steam at 100 lb. pressure, corresponding to a temperature of about 325 deg. Fahr. At this temperature the asphalt, which is liquid, is run into casks, and as known as epuré. In this condition it is ready to be converted by the addition of a flux into what is called for trade purposes "Refined Trinidad Lake bitumen."

Another extensive deposit of lake asphalt is that at Venezuela, Bermudez. This covers an area of some 1,000 acres, but is very shallow compared with the Trinidad Lake. It varies in consistency in different parts of the lake from viscous maltha to solid bitumen. The crude material is richer in bitumen than that of Trinidad, but the composition of the refined bitumens is not identical in each.

Deposits are also found in Cuba and other parts of the world.

ROCK ASPHALT.

Rock asphalt is entirely different, both physically and chemically, from lake asphalt; in fact, the only thing common to each is that they both contain bitumen. The following is a comparison:—

DIVERSITIES OF LAKE AND ROCK ASPHALTS

	Trinidad Lake. (dry.)	Rock (Seyssel.)
Specific gravity... ...	1·4	2·25
Hardness ...	plastic	tough
Inflammability ...	inflammable	fire resisting
Fracture ...	conchoidal	rough
Melting point ...	170 Fahr.	(disintegrates)
Bitumen content ...	54	8
Calcium carbonate ...	...	91
Sulphur	3	—
Mineral matter (silica)	35	—
Organic matter	8	—

Rock asphalt is correctly described as a limestone naturally impregnated with from 6 to 14 per cent of bitumen, which gives it a rich brown colour. When the bitumen is extracted by means of a solvent the limestone is left in a state of very fine subdivision, and we might consider briefly how the stone became impregnated.

Few rocks vary more in texture and composition than limestone; it may be a friable chalk-like deposit, a finely-grained rock resembling sandstone, or a hard, close-grained mass having a conchoidal fracture. In rock asphalt we have an example of a finely-grained deposit, the particles being cemented together, as it were, with what would first appear a foreign matter. The deposits are found in various thicknesses, 6 ft. and less to over 20 ft., and are at times laminated. The existence of laminæ indicates tranquil conditions of intermittent deposit, and such thin layers occur only where the mineral is fine-grained, as in mud or shale. The alternation of thin bands of laminated rock with others non-laminated indicates considerable oscillation of currents from various quarters bearing different quantities and qualities of sediment.

The conditions favourable to the formation, or rather to the impregnation of limestone with bitumen are the diffusion of organic material, either vegetable or animal, through the finely-divided calcareous deposit and the exclusion of air from the material undergoing decomposition. There is reason to believe that no more heat was required than that afforded by the process of fermentation to bring about the changes by the aid of anaërobic bacteria. It is probable that the organic matter was in the form of delicate water plants, together with abundant infusorial or microscopic vegetable life. That the unimpregnated laminæ should exist between the impregnated rock is conclusive proof that the bitumen-forming agents must have been entombed in the lime deposit, and that the impregnation was not brought about by external emanations, as is sometimes suggested.

PRINCIPAL DEPOSITS OF ROCK ASPHALT.

Rock asphalt appears to have been discovered in the Val de Travers, Switzerland, by a workman named Jost, who brought it to the notice of a Greek physician named Eyrinis in 1712, and he was granted a concession by the King of Prussia to work the rock.

However, the credit is, I believe, due to Count Sassenay for starting the asphalt industry on business lines and correcting mistakes made by Eyrinis, mentioned hereafter. In 1802 Count Sassenay secured the concession of the Seyssel Mine, and carefully investigated the properties of the rock and trained his workmen in the proper methods of using it.

The principal deposits on the Continent which are used in this country are found at Val de Travers (Switzerland), Limmer and Vorwohle (Germany), Pyrimont, Seyssel (France), Ragusa (Sicily).

The rock is quarried or mined, according to whether the seam is near or far below the surface of the ground. As previously stated, the seams vary in thickness; they also vary considerably in texture and composition, even from the same quarry.

MASTIC ASPHALT.

Mastic asphalt is a mechanical mixture made by intimately compounding powdered rock asphalt with additional bitumen, and with or without an admixture of coarse grit.

Dr. Eyrinis appears to have conceived the idea of using mastic asphalt for building purposes. In a work published by him in 1721 he describes its preparation in the following terms: "The stone is taken just as it comes from the mine and heated a little so that it can be ground to a coarse powder. A little pitch is added to it so that it will fuse the more readily, and also cause the entire mass to become thinner, and then the whole is heated over a moderate coal fire.

"The wood or stone upon which the cement is to be spread must have been previously well dried and also heated a little. When using the cement upon stone the present custom has been to add 1 part of pitch to 10 parts of the asphalt. For use with wood rather more pitch must be added. When, however, marine work is being put in hand, it will be necessary to supervise the workmen with the greatest care in order that their work shall be as may be best suited for the particular purpose, though it will suffice for the present to add that the asphalt in question becomes softer and more liquid the more it is heated. In carrying out the fusing of the asphalt, however, it is always necessary to add a little pitch. The fusing should be carried out in a copper cauldron containing the exact quantity of asphalt that may be required for the work then being put in hand.

"The pitch must be melted first, then the asphalt added little by little, the mixture being continuously stirred throughout with a stick or shovel, until both materials have become intimately mixed together. Resin makes it harder and causes it to withstand the heat of the sun better. Dutch pitch, obtained from the roots of trees, makes it tougher. The mixture must consist of 1 part of pitch to 7 common pitch and 8 or 9 parts of asphalt, according as to whether it is desired to make it more or less liquid—depending upon the nature of the work to be done—and before it is quite cool this cement can be levelled or brought to a smooth surface by means of a hot iron such as is used by builders for cement work. Above everything else, the workman must take care that the stone or other material to be coated shall be thoroughly cleaned before the cement is laid upon it, and then if any weakness is found afterwards in the work it cannot be occasioned by the material used, but only by the kind of use and the method adopted in the spreading of it."

As may be imagined, Dr. Eyrinis' method was not successful, the cause of failure evidently being due to the unsuitable material used as a flux, and let it be stated that the cause of dissatisfaction in mastic asphalt work to-day is largely due to the same cause

Substitutes for bitumen, such as gas tar, pitch, and petroleum refuse, have a deleterious effect on rock mastic asphalt, and should never be used.

The process of manufacture of mastic asphalt, as carried out by one or more well-known firms, and which may for our purpose be accepted as the method generally adopted, is to first crush the natural rock to pieces about the size of walnuts. After passing through the crusher the asphalt is carried up by elevators to a disintegrator which runs at a high speed, grinding the material to a fine powder. The powder is then cooked in specially made cauldrons, worked by agitators with certain proportions of bitumen, and when heated to a temperature of about 300 deg. Fahr., a proper on of from 10 to 20 per cent of fine grit is added to make gritted mastic, and which is thoroughly incorporated with the asphalt by the rotary working of the agitators. It is then turned out into iron moulds and made into blocks of various shapes weighing about ¼ cwt. each.

To apply the mastic these cakes are broken into small pieces and carefully placed in a cauldron with just sufficient bitumen as a flux. It is then heated to a temperature of about 280 deg. Fahr., the whole being carefully stirred until properly cooked. When ready it is taken from the cauldron with an iron bucket and spread by means of hand floats to the required thickness and rubbed with fine sand. As the mastic is likely to have blowholes, it is important that it should be applied in two coats where required for damp proofing.

TESTS FOR ASPHALT.

The following tests on asphalt as may be applied by an engineer or architect, but it is pointed out that special apparatus, as also an intimate knowledge of analytical chemistry, is necessary to determine the exact composition of the material we are now considering. Much useful information on this subject is contained in "Natural Rock Asphalts and Bitumens," by Arthur Danby, who has kindly permitted the author to cull some of the following tests:—

A simple method to adopt in order to tell one artificial bitumen from another consists in holding the product over an open flame and smelling the vapours which are given off. The residues from coal tar, wood tar, and tar oil obtained, each of which has its own distinctive odour, is easily noticeable when the material is heated.

A definite test for the presence of coal-tar pitch in a suspected material is based on the fact that it contains a quantity of free carbon in contrast with the natural bitumen, which contains none. Natural bitumen presents a uniform brownish appearance when a little is rubbed on a piece of ground glass and examined under a microscope. In an adulterated sample the free carbon may be seen suspended in the bituminous matter like small black dots, though to the naked eye the mass appears to be true bitumen.

Mastic should be able to be cut with a knife. If of too hard or stony a nature, it proves an insufficiency of bitumen.

When held in a gas flame it should soften; it should never run or begin to ignite. If it burns the mastic contains too much flux, and for practical purposes the material will prove too soft.

APPLICATION OF ROCK ASPHALT.

As a material for paving streets asphalt has much to recommend it from a sanitary point of view. It is non-absorbent, easily cleansed, and suffers no material change from variations of temperature. Its suitability for this purpose was discovered by accident in 1849. Fragments of asphalt dropping from the carts which transported it from the quarry along the road became heated by the sun, and were crushed to powder and compacted by the continual passage of the carts until a hard, smooth track was formed. The phenomenon thus presented, followed by many experiments, led to the perfect method of constructing the rock asphalt road now in use.

In 1854 the first street of compressed asphalt was laid in Paris, and covered an area of 950 sq. yds. The first street to be so treated in London was Threadneedle-street in 1869.

Rock asphalt may be utilised for road paving either as macadam, compressed powder, or as compressed tiles. As a macadam it would appear not to have been quite satisfactory, judging from the report on the Eltham-Sidcup trial road; but the author constructed an asphalt-macadam road several years ago which gave satisfaction.

For compressed work the rock is prepared by heating the powder in revolving cylinders to a temperature of 280 deg. Fahr., and as soon as the moisture has evaporated the heated powder is placed in iron-lined vans, and taken to the street where it is to be laid. The powder is then raked over the prepared concrete surface to the thickness required and rammed with hot pelons, smoothed to a polished surface, and then rolled with a heavy hand roller. It gradually becomes cold, and in time is compressed into solid rock again by the traffic. The usual thickness of compressed asphalt is 2 in. for heavy and 1¼in. for light traffic.

It is essential that compressed asphalt should be laid on a foundation of good Portland cement concrete about 6 in. thick. Neglect in this respect has been the cause of many failures.

APPLICATION OF MASTIC ASPHALT.

Mastic asphalt is a most useful and efficient material, and is eminently suited to meet certain sanitary requirements. It is damp-proof, fire-resisting, vermin-proof, durable, has certain antiseptic properties, and is easily applied by a skilled hand to roofs, floors, walls, and for a variety of purposes in engineering and building works.

DAMP-PROOF COURSES.

To resist damp no better material exists than asphalt or bitumen properly applied. Clause 20 of the Model By-laws issued by the Local Government Board requires that every wall or pier of a new building shall have a proper damp-proof course of sheet lead, asphalt or slates laid in cement or other not less durable material impervious to moisture beneath the level of the lowest floor timbers, and at a height of not less than 6 in. above the adjoining ground.

The by-law is quite clear, but the loose method of applying the terms "asphalted" and "bituminous" to felts treated with coal-tar products tends to bring the genuine article into disrepute; so much so that a circular was recently issued to builders by the district surveyors in London stating that "the material commonly known as 'felt dampcourse,' asphalted felt or similar material will not be approved unless a distinct and sufficient layer of natural asphalt or bitumen is provided in connection therewith."

This cheap substitute for the genuine article cannot be too strongly condemned. No asphalt or bitumen is used in its manufacture, and the fibrous material employed is subject to rapid decay in damp situations.

The author knows of extensive property in London which is in a very unsatisfactory condition owing to this worthless material having been used, and has frequently replaced it in existing buildings with a genuine damp-proof course at great expense to the owners. This, however, is the only remedy.

With respect to the fire-resisting properties of mastic asphalt, much will depend on the quantity of bitumen it contains, the latter material being highly inflammable. It is not only the spread of the fire and the stability of the building that must be considered in case of fire occurring, although these are important factors, but the danger to the firemen employed in its extinction by falling débris. The London Building Act, 1894, sec. 61, states that the flat, gutter and roof of every building, &c., shall be externally covered with slates, tiles, metal or other incombustible materials. It would appear from a recent circular that the London County Council does not consider asphalt an incombustible material. It should be pointed out, however, that it is far more so than some of the metals —*e.g.*, lead and zinc—which are permitted by the Building Act.

APPLICATION OF BITUMEN SHEETING.

For several years past bitumen sheeting has been used for waterproofing purposes, more particularly for horizontal damp-proof courses, lining of reservoirs, sewage tanks, filter-beds, swimming baths, &c., with great success.

The sheeting is manufactured by coating jute cloth on either side with a heavy layer of bitumen. It is made in standard size sheets, each measuring 24 ft. by 6 ft., and is about $\frac{3}{8}$ in. thick. It has the advantage of being more easily laid than mastic asphalt.

It is not suitable for vertical work unless supported on the outer face. The most satisfactory method of fixing in a vertical position, as in the case of reservoirs, &c., is by the use of special wall ties, which are built into both the inner and outer walls.

To fix the material in a horizontal position the sheets should be carefully unrolled and laid over the surface to be covered, due allowance being made for a 3-in. lap at the joints. The sheeting should then be left for a few hours in order that it may take a proper bearing before jointing. A special jointing-iron

... then heated, and carefully passed between the laps to soften the bitumen on the inner surfaces, and these should promptly be united with a wooden mallet.

CAUSES OF FAILURE IN ASPHALT WORK.

The causes of failure are usually due to either the material used or the method of using it. These may be guarded against to a great extent by entrusting the work to a reputable firm. There are few materials which lend themselves to adulteration more than asphalt, and few which require more careful manipulation. Large quantities of low-priced mastic have been imported to this country from Germany, and still larger quantities are "faked" here during their preparation and use. The author contends that the work to be done, however small the job may be, should be executed by the firm's own workmen. The mastic blocks should bear the brand of the firm, and no other material should be allowed to be mixed with them except the bitumen flux

DISCUSSION OF MR. NANDY HOSKINS'S PAPER.

The CHAIRMAN (Mr. H. Percy Boulnois) remarked that he had been exceedingly interested in the paper, as he had had a great deal to do with asphalt in many forms. He had never seen diagrams prepared and put on the screen which displayed the application of asphalt in numerous forms so well as the diagrams shown that night. He believed there were many gentlemen in the room who were old hands with asphalt. He saw Mr. Delano, who was one of the introducers of asphalt, and he remembered that gentleman reading a paper before the Institution of Civil Engineers on the subject. That was many years ago, when he (Mr. Boulnois) was a young man. Mr. Hutchinson, whom he saw present, was also an expert on asphalt. Beginning with the question of bituminous sheeting, he agreed that it was a most valuable material. It was, perhaps, an unfortunate thing that there were so many materials on the market which were more or less substitutes; but if one got the proper bituminous sheeting the effect of its application was admirable. But it must be protected, and this was done, as had been shown on the screen, by applications which were endless. It was the same with mastic asphalt. Years ago he made cheap and lasting urinals with concrete and asphalt. The stalls were covered with asphalt, and they lasted a great number of years, though, as they knew, acid had a bad effect upon asphalt. He took great credit for that work because it had never been done before, and he believed those urinals were existing to this day. With regard to the failures of asphalt, he did not know whether Mr. Delano would agree, but it seemed to him that the asphalt laid on the streets was not so good as it was in the past. Whether there was some defect in the quarries or mines, whether the flux was wrong, or whether the workmen did not understand the job, he was convinced that compressed asphalt was not so good as it used to be. He might say he himself was engaged more or less in 1872 in laying asphalt in Buda Pesth. Asphalt had been used more abroad than in this country, and the reason probably was that under certain climatic conditions it became greasy and slippery for horse traffic. When we substituted, as we ought, mechanical traction for horses, asphalt would come into its own. With regard to failures and blowholes, the latter probably arose from laying the asphalt on something damp. The asphalt was hot, steam was generated, and the water arising therefrom percolated through and made a blowhole. That, of course, was to be guarded against. In conclusion, Mr. Boulnois drew attention to the various exhibits on the table, which, he said, were admirable.

Mr. JOHN HUTCHINSON said that no one could take priority of Mr. Delano in such a discussion as this, and he did not intend to intervene between that gentleman and the audience except for the purpose of calling attention to the fact that twenty years ago a book written by the chairman, Mr. Boulnois, was published with the modest title "Carriageways and Footways." The chairman himself might have [illegible] to the fact that on page 67 there was a chapter on asphalt pavements, and, further, that there was a chapter or two on mastic asphalt. During the twenty [illegible] since it was published this book had been a book of reference, and it contained the very best practice in the making of the asphalt road of to-day. The book consisted of 143 pages, and if those present had time to run over it they would be doing a great service to what was called the road problem.

Mr. BOULNOIS said he must take notice of the extraordinarily flattering remarks of Mr. Hutchinson. If he had done any good to anybody in his life he would be only too pleased. He was pleased to hear [illegible] Mr. Hutchinson as an expert, [illegible] and that, indeed, the book was still "alive." Somebody once said: "Oh, that mine enemy would write a book!" [illegible] truth in what that implied. He had written two books, and when he was in court in a professional capacity he would be reminded that he had written this, that, or the other. On a particular occasion which he recalled the decision was in his favour, but it might have been against him; but his experience was a warning to them not to write books.

Mr. H. D. DELANO observed that the chairman had quoted the saying "Oh, that mine enemy would write a book!" He (Mr. Delano) wrote a book thirty years ago, which was the amplification of a paper he had read at the Institution of Civil Engineers, and the matter with which it dealt was the only point on which he was at variance with the author of the paper read that night. From 1871 he had seen most of the asphalt mines, and had taken special notice of the elements of asphalt. An old friend of his laid it down, and he (Mr. Delano) followed him in the book to which he had made reference, that asphalt should be called bituminous limestone. That might have been from interested motives, it was true. The Americans mixed it with grit, and called it asphalt, and they had been followed by a great many engineers and scientists, and he thought it was a misfortune. With respect to the origin of asphalt, it had been stated that it was formed by the rising of bituminous vapours to the surface. These vapours were forced up into the soft limestone, and the result was the formation of asphalt. They would find that it consisted of layers of non-impregnated limestone, and above them impregnated limestone. There were theories about asphalt being formed by shell animals, but he did not know how it was done. They would notice that there was impregnated and non-impregnated material in the same facing. Streaky asphalt was produced by the action of water. The asphalt in the lake of the Bermudas presented a perfectly flat surface, and it was so glassy that pelicans mistook it for water.

Mr. J. HUTCHINSON, alluding to Mr. Delano's book, said he had searched high and low for it, but he could not find it. He would gladly give a sovereign for a copy, because it was a most useful, practical work, contained [illegible] It was stated in that book that of all the bituminous materials, Trinidad Lake asphalt was the best. They were delighted to find that the author of the paper was himself a practical man. He told them that he had made experiments with natural rock asphalt as a macadam. The first attempt to use natural rock asphalt as a macadam pavement was made at Worthing, and he might say that Mr. Scott, chairman of the Val de Travers Company, [illegible] first of all paviors in Great Britain, and had done more for the advancement of the art than any living man, found that the roads in Sicily were easily made by the action of the passing carts under a hot sun upon the débris dropped from the vehicles carrying rock asphalt. He conceived the idea of bringing the material to this country, and his efforts were attended with success, as every person who had seen the main street of Worthing would admit. The next application made by Mr. Scott was on the Thames Embankment, where, as they knew, there was a great deal of fast and slow traffic. There it proved a non-success. The great secret of a successful asphalt-macadam pavement was to have the rock of a moderate and equal richness in bitumen. He did not know where this was to be found except in Greece, adjacent to a place where there had been an earthquake years ago. Natural rock asphalts were produced in Neuchatel and other places, and they were the premier paving materials of the world. Analytical comparisons had been drawn between lake asphalt and rock. One was described as inflammable, and the other as not. Trinidad asphalt should not be described as an inflammable material; the asphalt cement had to submit to a flashpoint test of over 350 deg. Fahr. He was with the author in saying that natural rock asphalt was the premier material of the world for paving and for sanitary work.

The CHAIRMAN said that with regard to natural rock asphalt being used as macadam, he had seen the work at Worthing, but he had never ascertained what

p cent. It was found that rolled in order to get it down to consistency. The surveyor of Alexandria, Egypt, stated that it was the best material for that climate. Why it had been a failure at Sidcup he (Mr. Boulnois) did not know, but he thought it would be found that an excellent road could be made out of rock asphalt.

Mr. C. T. Evenett seconded that he had seen the asphalt at Calcutta, but it did not stand the climatic conditions there. He moved a vote of thanks to the author of the paper.

Mr. T. J. Mosscrop seconded the proposition. He thought that, take it on the historical, scientific and practical points of view, the paper was both entertaining and interesting. He had lately had to inquire into the bituminous materials used on the special joints of pipes. He had pipes by a well-known maker standing in the sun for a little time, and found the material practically running off the pipes. In another instance he found the material brittle and cracked. He communicated with the Standardisation Committee who had under consideration the standardisation of stoneware pipes, and asked that they would consider a bituminous material. He gathered that this was to be done. He went to the manufacturers for the constituent parts of the materials in their pipes, and they would be surprised at the diversity of the materials. One firm assured him they were making the best article, because they had an experienced man who had been making it for thirty years, and knew how to judge it. As a matter of fact it was not only the material that had to be considered, but also the way it was manipulated. He would ask the author if he had considered what effect sewage had on asphalt—whether it had a deleterious effect on the material.

Mr. Nandy Hoskins, replying to the discussion, suggested that perhaps Mr. Delano did not now agree with what he wrote thirty years ago. Of course, methods had changed, and the methods applying to asphalt had changed with those applying to every other material. He did not know what was the reason for the failure of the Sidcup trial, but he might say that his road was made before ten years ago. As he said, it was excellent, but it worked very slippery. As to the lasting qualities of asphalt, he had instanced a road thirty years old and another which only lasted three years, both put down by the same firm. Of course, this must be caused by difference of surface, as the materials were from the same mine. Blow-holes would arise from putting the material on damp concrete. As to American asphalt, everybody wanted to call their material asphalt, but he did not think the term should be applied to anything except that containing bitumen or a natural material. He could not agree with the suggestion of Mr. Delano that asphalt might be produced from vapours arising from the interior of the earth, for it seemed to him impossible that anything in the form of gas could pass up with impregnated layers on the upper rock. Mr. Hutchinson mentioned the inflammability of lake asphalt, and on that point he would merely remark that he used the comparison to show the difference between the two asphalts. With regard to the Calcutta experiment, he was still of opinion that the material should have another trial in that city. Judging from the sample of the road shown it had been very badly laid, probably on a damp foundation. He had had no experience in connection with the subject of sewage in contact with asphalt.

ROYAL SANITARY INSTITUTE.

SHREWSBURY MEETING.

Mr. H. Percy Boulnois, M.INST.C.E., will occupy the chair at a meeting of the Royal Sanitary Institute which is to be held at the Guildhall, Shrewsbury, on Friday, May 28th, when a discussion on "The Value of Mechanical Filters in the Purification of Water" will be opened by Dr. Thomas Orr.

The proceedings will commence at 7.30 p.m.

On the following morning inspections will be made of the Shrewsbury housing scheme, Ditherington, mechanical filters at Chester-street, and the public abattoir. The members will be entertained to luncheon at one o'clock by the mayor.

BRISTOL MEETING.

On June 11th, at Bristol Guildhall, a discussion on "Co-ordination of Military and Civil Sanitary Services in War-time," will be opened by Dr. D. S. Davies, medical officer of health, and Mr. L. S. McKenzie, ASSOC.M.INST.C.E., city engineer of Bristol.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. S. Pickering, M.INST C.E., Borough Surveyor and Water Engineer, Cheltenham.

NORTHWICH MEETING.

A North-Western District meeting is to be held at the Council Offices, Northwich, on Friday, May 28th.

Programme.

11 a.m.—District executive meeting.
11.30 a.m.—District meeting.
Reception in the council chamber by the chairman of the council, Mr. Councillor Worsley, J.P.
District business.
Paper by Mr. J. Brooke, engineer and surveyor, on "Municipal Works of Northwich," which will be taken as read.
Discussion.
12.45 p.m.—Visit to baths.
1 p.m.—Lunch at Lion and Railway Hotel (tickets 3s. each).
2 p.m.—Leave Lion Hotel.
2.15 p.m.—Arrive Marston salt rock mine.
3 p.m.—Leave Marston salt rock mine.
3.30 p.m.—Arrive Anderton lift.
4 p.m.—Leave Anderton lift.
4.15 p.m.—Arrive swing bridge.
4.30 p.m.—Leave swing bridge.
4.35 p.m.—Arrive sewage pumping station.
4.50 p.m.—Leave sewage pumping station.
5.20 p.m.—Arrive Cote Brook waterworks.
6 p.m.—Leave Cote Brook waterworks.
6.15 p.m.—Arrive Blue Cap Hotel (tickets for tea 2s. each).
7.20 p.m.—Leave Blue Cap Hotel.

Tickets for motor char-à-banc 2s. 6d. each.

It is necessary that the nationality of persons attending this meeting should be declared.

A. W. Bradley, M.INST.C.E.,
Hon. District Secretary.

St. Helens.

SOUTHALL MEETING.

A meeting of the Eastern District will be held at the Town Hall, Southall, on Saturday, June 5th.

Programme.

2 p.m.—Meet at Town Hall, Southall.
Business.
Read minutes of previous meeting.
2.30 p.m.—Proceed by motor omnibus (fare 1s. 6d. each)—
(*a*) To visit open-air bath;
(*b*) Through Osterly Park to inspect sewage disposal works.
4.30 p.m.—Return to town hall to tea, kindly provided by the engineer and surveyor, Mr. Reginald Brown, M.INST.C.E.
5.15 p.m.—Discussion of works inspected, and papers by Mr. Reginald Brown (member), "Fourteen Years' Municipal Work in a London Suburb," and Mr. J. H. Edmondson, F.C.S., "Fitting up and Working of a Sewage Works Laboratory."

Conveyances for the various visits have been arranged, tickets 1s. 6d. each.

J. A. Webb,
Hon. District Secretary.

Great Stanmore.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

WIMBLEDON MEETING.

On Saturday, May 29th, a visit will be paid to the Wimbledon sewage works and the S.O.S. works, Durnsford-road, Wimbledon, near Wimbledon Park Station (District Railway).

Members to meet at 3 p.m. at pumping station, Durnsford-road, to view the pumping plant, lime mixing plant, filters and sludge pressing plant, the atomisation of sewage devised by the borough engineer (Mr. C. H. Cooper, M.INST.C.E.), and the recovery of fats resulting from such treatment. Afterwards an inspection will be made of the S.O.S. works, and the products resulting from the destructive distillation of sewage sludge.

INSTITUTION OF MUNICIPAL ENGINEERS.

EASTERN, NORTH-EASTERN AND SOUTH-EASTERN DISTRICTS.

A meeting of these districts will be held at Dunstable on Saturday, May 29th.

PROGRAMME.

1.30 p.m.—Reception at the town hall.

2 p.m.—Leave town hall by conveyance. (Approximate cost of conveyance, 1s. 6d. per head.)

2.15 p.m.—Arrive at sewage disposal works.

3 p.m.—Leave sewage disposal works.

3.10 p.m.—Arrive at gasworks.

3.30 p.m.—Leave gasworks, and proceed on foot to Maiden Bower (old British camp), onward by Green Way (old British road) to Totternhoe Knolls (old British and Roman camps). Inspect cottages erected by the Luton Rural District Council at Totternhoe.

4.30 p.m.—Proceed by conveyance to waterworks, &c.

5.20 p.m.—Tea at Dunstable (by kind invitation).

Descriptive notes on the various undertakings and inspections will be given by Mr. W. F. Wilkins, borough surveyor, Dunstable, and Mr. H. Pickering, surveyor, Luton Rural District Council.

Trains leave Luton (G.N.R., adjoining M.R. Station) for Dunstable at 12.20, 1.5 and 1.30, and Leighton Buzzard (L. & N.W.R.) for Dunstable at 12.25.

Trains leave Dunstable for Luton at 6.15 and 7.25, and for Leighton Buzzard at 6.5 and 8.13.

G. BELSON CHILVERS,
Hon. District Secretary.

Oundle, Northants.

COUNCIL MEETING.

The next meeting of the council will be held in London on Wednesday, May 26th, at 5.30.

B. WYAND,
Secretary.

39 Victoria-street,

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BOROUGH SURVEYOR.—May 15th.—Newport (I.W.) Town Council. £225—£250 per annum.—Mr. T. Ross Pratt, town clerk.

SANITARY INSPECTOR.—May 18th.—Hayfield Rural District Council. £60 per annum.—Mr. J. R. Bowden, clerk, 16 High-street, New Mills.

INSPECTOR OF NUISANCES AND SURVEYOR.—May 18th.—Todmorden Rural District Council. £104 per annum.—Mr. F. Hollinrake, clerk, Union Offices, Todmorden.

SEWAGE WORKS MANAGER.—May 20th.—Hanwell Urban District Council. £2 per week, with house.—Mr. S. W. Barnes, surveyor.

FEMALE HEALTH VISITOR.—May 21st.—Mitcham Urban District Council. £100 per annum.—Mr. Robert M. Chart, clerk, pro tem.

SANITARY INSPECTOR.—May 21st.—Mitcham Urban District Council. £200.—Mr. Robert M. Chart, clerk, pro tem.

ROAD FOREMAN.—May 21st.—Mitcham Urban District Council. £2 per week.—Mr. Robert M. Chart, clerk, pro tem.

SURVEYOR.—May 21st.—Mitcham Urban District Council. £250—£300.—Mr. Robert M. Chart, clerk, pro tem.

CLERK TO COUNCIL.—May 21st.—Mitcham Urban District Council. £250—£300.—Mr. Robert M. Chart, clerk, pro tem.

CLERK'S ASSISTANT.—May 21st.—Mitcham Urban District Council. £120—£150.—Mr. Robert M. Chart, clerk, pro tem.

SURVEYOR.—May 31st.—Llanfrechfa Urban District Council. £146 per annum.—Mr. William Clark, clerk, 44 Coronation-road, Cwmbran, near Newport, Mon.

CLERK OF WORKS.—Tyldesley Urban District Council. £2 10s. per week.—Mr. Francis E. Jones, engineer and surveyor, Council Offices, Tyldesley.

ASSISTANT ENGINEERS.—Public Works Department, Government of the Gold Coast. £350—£400 a year, with furnished quarters.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ENGINEER.—Public Works Department, British Guiana. £300—£400.—Crown Agents for the Colonies, Whitehall-gardens, S.W.

ENGINEERING AND SURVEYING ASSISTANT.—Derbyshire County Council. £150 per annum.—County Surveyor, County Offices, Derby

CEMENT INSPECTOR.—Federated Malay States.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

LEEDS.—May 17th.—For the construction of three underground transformer chambers, for the corporation.—1, Whitehall-road, Leeds.

WITHERNSEA.—May 18th.—For the erection of a reinforced-concrete wall, for the urban district council.—Mr. J. H. B. Kirton, engineer.

DERWENT.—May 18th.—For the erection of a stable and coach-house at the small-pox hospital, for the Joint Small-pox Hospital Board.—Mr. H. B. Williams, architect, Town Hall, Workington.

MANCHESTER.—May 18th.—For additions to laundry and accumulator house, for the Sanitary Committee.—City Architect, Town Hall.

GLAMORGAN.—May 19th.—For additions and other works at certain schools, for the county council.—County Hall, Cardiff.

DARLINGTON.—May 20th.—For the erection of a brick chimney 128 ft. high, for the corporation.—Mr. G. Winter, borough surveyor.

CAERPHILLY.—May 22nd.—For the construction of a concrete retaining wall, for the urban district council.—Mr. Alfred O. Harpur, surveyor.

CHORLEY.—May 25th.—For alterations to the discharge block and painting, for the Chorley Joint Hospital Board.—Mr. R. E. Stanton, clerk.

ISLE OF WIGHT.—May 26th.—For repairs and other work to a bridge, for the rural district council.—Mr. L. A. Cozens, surveyor, Walmer Villa, Castle-road, Newport, I.W.

SHEFFIELD.—May 28th.—For excavations and concrete work, for the Electric Supply Committee.—Mr. S. E. Fedden, engineer and general manager, Commercial-street, Sheffield.

CANNOCK.—May 28th.—For the construction of conveniences, for the urban district council.—Mr. R. Blanchard, engineer.

HASTINGS.—May 31st.—For the erection of band-stand and covered shelters, for the corporation.—Mr. P. H. Palmer, borough engineer.

GRIMSBY.—June 5th.—For alterations to "Rutland House," for the rural district council.—Mr. J. F. Wintringham, St. Mary's Chambers, Grimsby.

WEYMOUTH.—For the erection of 100 working-class houses, for the corporation.—Mr. W. R. Wallis, town clerk.

Iron and Steel.

SALFORD.—May 19th.—For the supply of welded steel main, for the Gas Committee.—Mr. W. W. Woodward, engineer, Gas Offices, Bloom-street, Salford.

DARLINGTON.—May 20th.—For the supply and laying of cast-iron condenser water pipes, for the corporation.—Borough Electrical Engineer, Haughton-[illegible], Darlington.

Roads.

MONMOUTH.—May 17th.—For the supply of materials, or for hauling stone for the repair of the main roads, for the county council.—Mr. W. Tanner, county surveyor, County Offices, Newport, Mon.

HOLYWOOD.—May 17th.—For the supply of stones for carriageways and footpaths, for the urban district council.—The Surveyor.

RUNCORN.—May 17th.—For the supply of granite macadam, setts, kerbs, and sanitary pipes, for the rural district council.—Mr. W. E. Hough, acting clerk.

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. MAY 21, 1915. No. 1,218.

Minutes of Proceedings.

The Economy of Testing.

There are certain bed-rock truths which have been established by experience and the test of time. It would be very foolish to proceed in a contrary direction unless one courted disaster, or at least a partial failure. It is not always a question of the use of the right materials, but of their quantity and quality. A ton of clean ballast and a hundredweight of cement will not make a good floor any more than dirty sand and poor lime will make a good ceiling. It is evident, therefore, that there must be great economy in following the results gained by testing. By testing one gets to *know*, and the accumulation of this knowledge allows of the carrying out of work on right and safe lines. It is known, for instance, that the design of a certain pipe for a certain purpose under certain conditions should be of such a material and of such a strength, because past experience has taught that it should be so; but a further test is required. The pipe may hold up to all the proper dimensions, and may look very good, but it is necessary that it should also be tested in its working position. In a recent case iron water pipes were cast and tested at a foundry under the supervision of an inspector. The pipes were struck with a hammer in all their parts while under pressure, and test bars of the metal actually used were also carefully proved. Subsequently the pipes when laid were tested in the trenches by hydrostatic pressure to 50 lb. per square inch above the working pressure, the result being that 460 10-in., 89 6-in., 97 4-in., 10 2-in. pipes, weighing about 141 tons, or over 8 per cent of the total weight delivered, were rejected. Can anyone but a town surveyor realise what it would have meant to have lived in that town had the final test not been carried out before the system came into work? Rule of thumb, or "having a shot at it," may be an easy way of taking up responsibility, but it is not usually economical. As one cannot take the cover off the earth and see the conditions below, it behoves us to use the boring tool or the sunk shaft to ascertain as much as we can. It has been said that 70 to 80 per cent of failures of works subject to earth pressure are those constructed in clay, and most of the reservoir dams which have failed have been through the movement of the clay foundations. We may be sure that had such clay been known to be treacherous it would not have been relied upon. Settlements and other mishaps frequently occur from buildings being erected on unknown foundations, which such happenings would be prevented if adequate investigation and trial had been previously made of the ground. The extra careful rule-of-thumb man may, on the other hand, cause great waste of materials by ignorantly overdoing the necessary margin. Knowledge [illegible] to a great saving in expenditure, allowing as it does a large enough—but not too large—margin of safety.

A dictum of Carlyle's is matter in the wrong place, which in many instances would be a good definition of waste too—a waste caused by the use of unsuitable materials. Failures in road surfacing, failures in roof covers, failures in wall painting, and the rest, are evidences of the lack of testing or experience. The good soldier is the man of tested qualities, upon whom his General may rely. It is economical to employ such a man [illegible] is worth many untrained, untested, raw recruits. It is the same in the engineering sphere—we shall be best served by using materials that have stood the test—bricks from the good brickyard, granite from the good quarry, pipes from the good foundry. There is no economy in using bricks which are affected by frost, or granite that pulverises under the steam roller, or pipes that burst under working pressure, because they may be cheap to buy. How are we to be sure of the quality of our materials? Only by testing, either carried out by ourselves or by others upon whom we may rely. How often the engineer and surveyor sighs for an expert opinion on some material which he would like to use, but which he has had no opportunity of testing himself! He dare not risk it on the recommendation of the interested purveyor, although the merits claimed for it in the lurid leaflet may be quite correct. Where a material or system has been thoroughly tested by a careful, disinterested investigator, it would be most valuable if the result could be scheduled in some permanent way for the use of official engineers—in which case the length of the visits of various commercial travellers would be much curtailed. Then a reference to the suggested schedule concerning some material or process for which every excellence was claimed—would show the opinion of the expert investigator, and the reliable words "unsatisfactory," "inferior," "not reliable," "good," "excellent," as the case might be, would lead to a great saving in time and trouble, to say nothing of future heartburning. It may be contended that the technical Press does at the present

time print a good deal of information on these lines. That is so; but it is not in the province of that Press to do what is needed, especially in the matter of protected articles. Life is short, and it seems a pity for knowledge acquired through laborious hours to be lost, and for man after man to tumble into mistakes which could be avoided by a reference to a book of duly recorded investigations or observations. Just as the tradesman finds it economical to test the suspiciously new-looking florin that may be tendered to him, so the engineer would find it economical to test the new materials as well as the old that may be offered for municipal consumption.

* * *

Back-to-Back Houses.

Not the least important of the changes effected by the Housing, Town Planning, &c., Act, 1909, was the prohibition of the erection of back-to-back houses. It will be remembered that the Act provides in terms that, notwithstanding anything in any local Act or by-law in force in any borough or district, it shall not be lawful to erect any back-to-back houses intended to be used as dwellings for the working classes, and any such house commenced to be erected after the passing of the Act is to be deemed unfit for human habitation for the purposes of the provisions of the Housing Acts. In other words, if any new back-to-back houses are erected, it at once becomes the duty of the local authority to make closing orders. The evils attendant upon this form of construction were very widely recognised for some years before the passing of the Act, and although, if our memory serves us, there were some eminent sanitarians who were prepared to defend this type of house as being quite healthy and fit for occupation, the general opinion was that their continuance was undesirable on grounds of public health. This opinion, however, referred to that type of house, well known in certain localities, in which two rows of houses having the whole of their backs contiguous are built in a common court, and there can be no doubt that the prohibition in the Act of 1909 was directed, primarily at all events, against this form of construction. The statute, however, contains no definition of the expression "back-to-back" houses, an omission which gave rise to an interesting discussion in the Courts last week as to the precise significance of the term.

It appears that the late Sir Edward White, having obtained a lease of a mews from Lord Portman, pulled down the old building and erected a block of ten garages with living rooms over. This new building consisted of one entire block of two floors, divided by four transverse party walls into five separate premises. On the ground floor the premises were divided into ten garages arranged in five pairs, each pair being divided by a half brick partition in which was a door, screwed up. On the first floor were ten dwelling-houses, arranged and divided into five pairs corresponding to the garages below. The dwelling-houses in each pair were separated partly by a lath-and-plaster partition, and partly by a ventilating shaft or area, into which opened a window from each of the back rooms. In the whole building there were five such shafts or areas, each being about 6 ft. long by 5 ft. wide. A curious feature of the case was that the building was apparently in accordance with the London Building Acts, having been passed by the district surveyor of the London County Council. The Marylebone Borough Council, however, were advised that, in spite of the presence of the ventilating shafts, the houses were "back-to-back" within the meaning of the Act, and they accordingly made closing orders. Against those orders an appeal was made to the Local Government Board, and that body, after holding a public local inquiry, stated a case for the opinion of the High Court.

The first question upon which the opinion of the Court was sought was whether the dwelling-houses were back-to-back houses within the meaning of the Act. For the appellant it was contended that the prohibition only applied to the well-known and ordinary type of back-to-back houses, and that it was designed to secure through ventilation—an object which was achieved in this case by the presence of the ventilating shafts. The respondent council, on the other hand, argued that, in the absence of any statutory definition, the expression "back-to-back houses" must be construed according to its popular and ordinary meaning, and so as to include all houses so built that their backs actually adjoin. In the result, the Court refused to say whether or no these houses were "back-to-back," holding that this was a question of fact which the Local Government Board must decide for themselves. They were unanimously of opinion, however, that it was open to the board to find as a fact that the houses were back to back if on the evidence they were satisfied that they were substantially within that description, and Mr. Justice Avory further observed that in his opinion the presence of the ventilating shafts did not prevent the houses from being back-to-back houses. A second question was also submitted to the Court—namely, whether the dwelling-houses were intended to be used as dwelling houses for the working classes. It was admitted that they were intended for occupation by private chauffeurs, and, in the absence of a statutory definition applicable to these provisions, the Court intimated that the board could find that these persons were included in the term "working classes" for the purposes of the case.

Town Planning Problems.

On Friday last the members of the Town Planning Institute were privileged to hear a second address by Mr. Thomas H. Mawson, HON.A.R.I.B.A., on "Some of the Larger Problems of Town Planning." In his former lecture, which was reproduced in our issue of March 19th last, Mr. Mawson emphasised the importance of what he called the strategic factor in fixing the location of a city, or in guiding its development upon the most advantageous lines. The principle to be borne in mind is that the life of a town must depend very largely upon the freedom with which its raw materials can be delivered and the finished or manufactured or mineral products of the district despatched. Among the many illustrations given by the lecturer, perhaps the most interesting was that of Port Sunlight, the strategic position of which was said to be perfect. Of the remaining "larger problems" dealt with, the first place was given to the provision of cheap power, which was followed by a discussion of traffic problems. This is, of course, a matter of the first importance, traffic being the very life-blood of a city. The problem of the town planner is so to plan his traffic streets that they exactly follow the lines of the bulk of the traffic which is to occupy them. For this purpose Mr. Mawson advocated a main division of all traffic into radial and gyratory, and pointed out that in the average city at least three-quarters of the wheeled traffic proceeds in a radial direction—that is either to or from the centre of the city. Finally, the lecturer dealt with the question of co-operation and collaboration between the various men who are concerned with city planning.

The need for co-operation is admitted, but the question remains how it may best be brought about. It was at one time necessary for municipal engineers to speak very frankly as to their

interest in and qualities of all the work, and to have always maintained that their knowledge and experience qualified them admirably to deal with the problems which arise. Mr. Macnamara's comment led him to the conclusion that there must be some peculiar virtue attaching to the name of a specialist, but it is that general training which will place him in sympathy with all the problems employed to execute the judicial duties, to coordinate and correlate the work of each, and to see that every interest is adequately [illegible] that the training of the municipal engineer [illegible] cannot be planning to be carried out in most cases under the general supervision, but with the advice and co-operation of such expert consultants as may be deemed necessary, having regard to the nature and extent of the scheme in hand?

The Rating of Sewers.

The committee of county councillors, and those sitting under the auspices of the Local Government Board, have recently had the question of the rating of sewers under consideration, and the authorities of London, Liverpool, and Glasgow have been invited to meet the question as well within the region of practical realities. To the layman it would appear that the simplest way is not subject to rating, the sewer, which forms part of it, would be in the same category. The cost of sewer maintenance is met by the assessment of property, and ergo it might be argued that to charge the sewers with a special rating is virtually to impose an additional assessment of questionable equity. What would seem to lend force to this line of argument is the fact that only a proportion of sewers, in some districts a relatively small one, are subject to rating, and that it is in many instances almost nominal in amount. In the circumstances, the Association of Municipal Corporations last year drafted a Bill to exempt underground sewers from rating, but the intervention of the war has held it up for the time being. The operative clause is in the following terms: "No sewer vested in a local authority which is situate below the surface of the ground, and where any sewer vested in a local authority is situate partly above and partly below the surface of the ground, no part thereof which is situate below such surface shall be assessed to any rate for the time being levied in the parish, district, borough, county or other area in which such sewer or part thereof is situate, and no rate shall be payable in respect of such sewer or such part thereof." Considerable opposition was offered to this clause, on the ground chiefly that the exemption which it contemplated was too comprehensive, including as it does joint sewerage boards and other such bodies, to whom payments are made for the use of their sewers. The association have met these objections by an amendment of the draft Bill excluding joint boards and other bodies. There the matter rests for the present, and there it will probably remain until the prospects of this class of legislation become more hopeful. The position of the law is certainly unsatisfactory, and the case for amendment is powerful, if not unanswerable.

* * *

Flies and Disease.

A further indication of the interest which has been aroused in the subject of the transmission of disease by flies was forthcoming a few days ago in the House of Commons, when the President of the Local Government Board was interrogated by Mr. Boland. The question was more immediately concerned with the steps to be taken to inform the public as to the danger to health which would be involved in a plague of flies under existing war conditions, and the reply was perfectly satisfactory in that it showed that the importance of the matter is thoroughly appreciated by the Local Government Board. The [illegible] reports on Flies as Carriers of Infection to which Mr. Samuel referred were noticed in these columns as they appeared, so that our readers [illegible] kept informed as to the progress of the latest scientific investigations. It is satisfactory to observe that a further circular letter is to be issued, because public opinion can only be educated by a constant repetition of plain if unpleasant fact that the common house fly finds its most productive breeding place in damp and filthy accumulations of offensive refuse. Many local authorities have already issued posters and leaflets on the subject, and if the Local Government Board were to issue some model leaflets for this purpose—a matter which they have under consideration—there can be no doubt that many more authorities would follow suit. If, as was suggested, a committee is appointed to deal with the subject, it is to be hoped that definite action will not be unduly delayed, for the need for action is [illegible]

Engineers and the War.

In the House of Commons recently several interesting questions were addressed to Mr. Wadsworth to the Parliamentary Secretary to the Admiralty and the Under-Secretary of State for War, with a view to ascertaining to what extent the services of civil engineers are being used by those departments. The form of the questions was rather complicated, and the answers were in the official manner, but one point at least which is of more than passing interest was raised. How many professional engineers are serving in the ranks, and their experience of labour and knowledge of materials thus lost to the nation? The war has been fairly described as a war of engineering, and if the forces of the country are to be organised to the best advantage, ordinary economy demands that engineering ability shall not be wasted by allowing qualified engineers to fight in the ranks. The patriotism of those who are voluntarily doing so is, of course, beyond all praise, and we do not wish to criticise unduly the form of organisation which permits them to render such service. The air is full, however, of rumours of a more thorough and efficient organisation of all the resources of the country, so as to insure as speedy a victory as possible, and we merely desire to suggest that in any new system which may be set up points of the kind we have mentioned shall be kept steadily in view.

* * *

Notts County Surveyorship.

A complaint in regard to the procedure adopted by the Notts County Council in connection with the appointment of a successor to their late county surveyor, Mr. E. Purnell Hooley, has reached us from a correspondent. After twice advertising the vacancy and receiving some 200 applications, the council, it will be recollected, appointed Mr. Haller, the deputy county surveyor, to fill the post. Mr. Haller may have been—and probably was—the best candidate, and is to be congratulated on his success, but we cannot help sharing the surprise of our correspondent that, if the very man for the appointment was on the premises, the council should have been unaware of his presence. Quite apart from the inconvenience and disappointment caused to a large body of unoffending men, a quite needless expense would seem to have been entailed in bringing selected candidates from various parts of the country to appear before the committee dealing with the appointment.

* *

Sewage-Treatment Experiments with Aeration and Activated Sludge.*

By EDWARD BARTOW and F. W. MOHLMAN, Director and Assistant Chemist respectively, State Water Survey, of Illinois University.

Experiments on the purification of sewage by aeration in the presence of activated sludge were begun a few months ago in the laboratory of the Illinois State Water Survey at the University of Illinois. With the advice of Prof. G. J. Fowler, of the University of Manchester, England, the experiments are following the lines described by Ardern and Lockett.

Our first experiments were made in bottles of 3-gallon capacity. Later we constructed a tank 9 in. square and 5 ft. deep, with plate-glass at the front and at the back. A porous plate was placed 4 in. above the bottom. An inlet for air and an outlet for any water which might pass through the plate were provided in the space below the plate. Compressed air furnished by the university power plant is used. All air is measured through an ordinary gas meter. The purified sewage is removed by means of a syphon. Experiments have been carried out in the laboratory at room temperature, thus far, with no special precautions to regulate the temperature.

For our experiments fresh sewage collected from the Champaign main sewer is used. It is a fairly strong domestic sewage, with no trade wastes.

AERATION OF RAW SEWAGE WITHOUT THE ADDITION OF SLUDGE.

Air has been blown into five separate portions of sewage until complete nitrification was accomplished, which has taken from fifteen to thirty-three days. The best result was obtained in the tank, where the air was distributed through the porous plate. For all analyses samples of the supernatant liquid were taken after one hour settling without filtration. In each case the free ammonia nitrogen was almost quantitatively changed to nitrite nitrogen, then the nitrite nitrogen in turn was changed almost quantitatively to nitrate nitrogen. (See Parts I. and II. of table.)

NITRIFICATION OF SEWAGE, UNIVERSITY OF ILLINOIS EXPERIMENTS.

(Parts per Million)

Date		Days	Nitrogen as Free NH_3	Al. NH_3	Nitrites	Nitrates
I.—No Activated Sludge Present.						
Dec	18	0	38·00	5·20	0·07	0·37
,,	19	1	30·00	4·20	0·72	0·38
,,	21	3	28·80	1·00	0·11	0·45
,,	28	10	22·00	2·60	5·00	0·20
,,	29	11	8·80	2·60	16·00	0·40
,,	30	12	1·90	2·40	23·00	1·00
,,	31	13	0·36	1·88	28·00	2·00
Jan.	1	14	0·16	1·48	31·00	1·00
,,	2	15	—	—	33·00	—
,,	4	17	—	—	33·00	—
,,	5	18	—	—	29·00	—
,,	6	19	0·25	1·52	27·00	3·00
,,	7	20	0·14	1·84	14·00	18·00
,,	8	21	0·28	1·68	0·50	31·50
,,	9	22	0·24	1·40	0·05	34·50
II.—No Activated Sludge Present. Uniform Distribution of Air through Porous Plate.						
Jan.	4	0	36·00	6·40	0·01	0·71
,,	7	3	34·00	3·40	1·20	0·60
,,	11	7	0·40	3·00	32·00	2·00
,,	18	14	0·60	2·60	7·50	18·50
,,	19	15	0·80	2·20	0·10	25·90
III.—Activated Sludge Present in Ratio of 1 Part of Sludge to 5 Parts of Sewage. Uniform Air Distribution.						
Feb.	24	0	27·00	—	0·05	0·50
,,	24	1	13·00	—	2·10	0·00
,,	24	2	8·20	—	2·80	10·50
,,	24	3	1·70	—	3·10	13·00
,,	24	4	0·20	—	2·60	18·00
,,	24	5	0·10	—	0·50	22·40

* The remaining figures in this column are for hours instead of days.

The formation of nitrate in the tank was accomplished in fifteen days with the use of 4,830 cub. ft. of air.

AERATION WITH SLUDGE.

The supernatant liquid was syphoned off and a fresh portion of sewage added to the sludge. In this, the second treatment, the effect of a small amount of sludge is nicely illustrated by the reduction of the time required for complete nitrification from fifteen days to four days, and the reduction in the amount of air used from 4,830 cub. ft. to 1,270 cub. ft. Thirty-four parts per 1,000,000 of free ammonia nitrogen in the raw sewage produced 23·8 parts per 1,000,000 of nitrate nitrogen in the supernatant liquid.

The supernatant liquid was again syphoned off, fresh sewage added and aëration continued. In this, the third treatment, nitrification was complete in two days, and but 720 cub. ft. of air was used. Thirty-three parts per 1,000,000 free ammonia nitrogen produced 22·3 of nitrate nitrogen. In the twelfth treatment the purification was completed in less than eight hours with the use of less than 128 cub. ft. of air, and 36 parts per 1,000,000 as free ammonia nitrogen produced 29·5 parts per 1,000,000 of nitrate nitrogen. In the thirty-first treatment, with sludge and sewage in the proportion of 1 to 5, purification was complete in less than five hours, using 35 cub. ft. of air. This is equal to 0·20 cub. ft. per square foot of surface area per minute, or about 3 cub. ft. per gallon of sewage. We have not yet attempted to determine the minimum amount of air required.

Samples taken at the end of each hour of aëration during some of the treatments have been tested for stability. A sample taken at the end of one hour aëration in the thirty-first treatment had not decolorised methylene blue at the end of twelve days. Since in one hour nitrification was not complete, it is therefore evidently unnecessary to obtain complete nitrification in order to obtain a stable effluent.

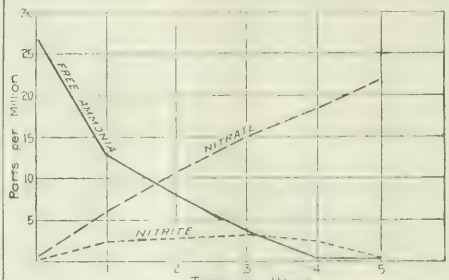


FIG. 1. SEWAGE NITRIFICATION WITH ACTIVATED SLUDGE PRESENT.

(Supplied by the Illinois State Water Survey.)

The progress of nitrification in the presence of activated sludge is apparent. (See Part III. of table, also Fig. 1.) Analyses indicate that there is no quantitative conversion of free ammonia to nitrite, followed by oxidation to nitrate, but that nitrates are formed simultaneously with nitrites.

The number of bacteria was determined during one treatment. Samples were taken after one hour settling. The raw sewage showed a bacterial content of 750,000 per cubic centimetre. The supernatant liquid, after aëration and settling one hour, showed but 20,000.

Through the courtesy of Frank Smith, Professor of Systematic Zoology, University of Illinois, biological examinations have been made of the sludge. Among the microscopic animals found are rotifers (*Vorticella* and *Philodina*), but the predominating organism is an annelid worm, known as *Aeolosoma hemprichi*. This organism is about 2 to 5 millimetres long and quite slender. It abounds in various kinds of fresh-water bodies where there is an abundance of decaying organic material, and thrives especially well where there is much fermentation and in waters contaminated with sewage, provided there is an abundance of oxygen.

It belongs to a group of worms in which reproduction occurs very rapidly by asexual methods. A fission zone is formed near the middle of the body of the parent worm and develops the head of one daughter worm and the tail of the other, and thus two new worms are formed from one. This requires not over two or three days, and is repeated for an indefinite number of generations.

* Abstract of a paper read before the American Chemical Society at New Orleans on April 1st, and is produced from *Engineering News*.

[illegible] presumably destroy at least their own weight of organic matter every day, and probably more. Because of the mode of reproduction, it takes but a short time to produce extensive colonies with great capacity for the destruction of organic material.

SLUDGE.

The activated sludge has evidently been developed by the multiplication of these worms originally present in the sewage, and the species found at varying points might differ. The sludge does not have an unpleasant odour, owing to the fact that it consists largely of living organisms. If kept for a long [illegible]

COMPOSITION OF SLUDGE.

Analyses of the sludge made by W. D. Hall have shown the following results: After drying first on the water bath and then for three hours in an oven at 100 deg. Cent., the loss, or moisture, was 95·54 per cent. The dried material contained 6·3 per cent. [illegible] phosphoric acid (P2O5) and 2·0 per cent. potash (K2O), equal to 5·31 per cent. P2O5 and 2·4 per cent. K2O. The volatile matter by loss on ignition.

From these chemical data the dried sludge would evidently have value as a fertiliser. If we calculate the value at 20s. per unit [illegible] of phosphoric acid and potash, we get a total value of 20s. per ton.

SOMERSET SURVEYORS' ASSOCIATION.

MEETING AT GLASTONBURY.

A meeting of the Somerset Surveyors' Association was held in the Town Hall, Glastonbury, on Saturday afternoon last.

The members were received by the Worshipful the Mayor of Glastonbury, the attendance including Messrs. F. W. Jones, ASSOC.M.INST.C.E., Frome Urban District Council (president), J. Ace Beynon, Frome Rural District Council (vice-president), G. and H. N. Alves (Glastonbury), L. Caplen (Yeovil), T. G. Crump (Taunton), H. Cousins (Street), R. S. Davey (Clutton), C. Durie (Williton), W. E. Groves (Dulverton), C. Harding (Williton), D. Hinchcliffe (Shepton Mallet), E. T. Howard (Wellington), E. H. Knapman (Wincanton), R. J. Nichols (county surveyor's office), T. Orchard (Clutton), S. S. Orchard (Taunton), F. Parr, ASSOC.M.INST.C.E. (Bridgwater), C. Pursey (Wells), J. T. Robinson (county surveyor's office), Edward Stead, ASSOC.M.INST.C.E. (county surveyor), and Mr. D. Edwards, ASSOC.M.INST.C.E. (Taunton), honorary secretary.

In opening the meeting, the MAYOR said he had very much pleasure in welcoming the members to Glastonbury. He remarked that the sewerage scheme had been a very difficult procedure from the beginning, owing to the peat. He was very sorry he was unable to accompany the members round the works owing to particular business, but no doubt Mr. Alves would interest the members in the works.

The PRESIDENT said it gave him much pleasure to thank his Worship on behalf of the association for the very kind reception he had given them. He was quite sure that the meeting would be of benefit to the members, and that the inspection of the works that had been carried out would prove very instructive. These were the kind of works they liked to visit—works that had been difficult; from such works they learned a good deal.

The SECRETARY read the minutes of the previous meeting, which were adopted and signed as correct.

The PRESIDENT moved a vote of condolence with the family of the late Mr. W. A. Collins, surveyor to the Bridgwater Rural District Council, whose death was announced in last week's SURVEYOR. He could not say how extremely grieved he was to hear of the sad loss that the association had sustained. Mr. Collins was a leading member of this association, and he was the prime mover in its inauguration. He was the first secretary, and later became president.

The motion was passed in silence, the members upstanding.

Letters of apology for non-attendance were received from Messrs. Johnson (Keynsham), E. J. H. Padfield (Wincanton), Reg. Stephens (Chard), and Knowles (Clevedon).

The PRESIDENT stated that, as the members were aware, under the association's scheme a premium was given annually by Mr. Stead, the county surveyor. Mr. Stead [illegible] connection with it and wished it to be called the "Telford" premium, which he (the president) thought was a very excellent name for it. The premium treated of work that they were all connected with, and he hoped it would appeal to the members of the association, and that they would let them have a score of papers in competition for it. The rules were very clear and everything was quite straightforward, so that they would have no difficulty in following the thing through. There was a premium of two guineas and another offered by Mr. Parr of half a guinea, which the latter wished to be competed for by the younger members of the association, and which is a standing premium from year to year. They very much hoped they would get a greater number of papers than in the past year.

The [illegible] which any of the members at any time in the ordinary course of their duties might meet with, and he thought it would be very helpful to everybody if the scheme was energetically taken up. In addition to having the competition itself, they would have the value of criticisms which would be offered at the annual general meeting. He appealed to them all, especially the younger members, to assist in this matter.

Mr. C. Harding, assistant surveyor to the Williton Rural District Council, was elected a member of the association, and Mr. H. N. Alves was transferred from [illegible]

At this point the PRESIDENT referred to a paper on [illegible] Mr. H. N. Alves, and the members were invited to [illegible] Bridge, the pumping station and tanks at Porcheshall, and thence proceed to the sewage disposal works. Mr. Alves' paper appears elsewhere in this issue.

Mr. A. P. I. COTTERELL, M.INST.C.E., the engineer of the sewage scheme, met the members at Northload, and accompanied them round the various works, giving a brief *résumé* of the various difficulties that were met with and overcome during the operations.

The PRESIDENT moved a hearty vote of thanks to Mr. Cotterell for so kindly explaining the extremely interesting works, and complimented him upon the ingenious way he had got over exceptional difficulties. This was seconded by Mr. CRUMP, and carried unanimously.

Mr. COTTERELL responded, and remarked that Mr. H. N. Alves had been most efficient, and that a lot was due to him for the success of the works.

At the invitation of Mr. G. Alves, the members returned to Glastonbury for tea, after which there was an interesting discussion in which Messrs. G. and H. N. Alves, H. Cousins, F. W. Jones, F. Parr, D. Hinchcliffe and C. Pursey took part.

A hearty vote of thanks to Mr. Alves for his very excellent paper and for the useful information he had given in answer to the various questions put to him, was moved by the PRESIDENT. This was seconded by Mr. H. COUSINS, and carried unanimously.

A hearty vote of thanks to Mr. G. Alves for his great kindness in providing the members with tea was proposed by Mr. J. A. BEYNON, and seconded by Mr. F. PARR, and Mr. D. EDWARDS proposed a vote of thanks to Mrs. H. N. Alves and Miss Alves for their assistance in providing and dispensing the tea.

Surveyors' Institution. The annual general meeting of the institution, to receive the report of the council and the announcement of the result of the election of officers for the ensuing year, will be held in the lecture hall on Monday, May 31st, at 5 o'clock. The prizes awarded to successful candidates in connection with the recent preliminary and professional examinations will be presented by the president.

Hotel Water Supplies.—The latest and largest hotel to cater for the comfort of London's myriad visitors is the Regent Palace Hotel, which occupies a huge island site a dozen yards from Regent-street, behind the County Fire Office and the Café Royal. The hotel, which is the largest in Europe, has over a thousand bedrooms, each bedroom being supplied with hot and cold water, and guests are offered the luxury of a soft-water supply—the softening installation being carried out by Messrs. [illegible] the well-known Danish firm, who have made water purification their speciality. The kitchens, boiler-house, and heating system are also supplied exclusively with soft water from a separate Lassen-Hjort installation placed in the basement.

Some of the Larger Problems of Town Planning.

By THOMAS H. MAWSON, HON.A.R.I.B.A.

[Lecture delivered before the Town Planning Institute on Friday last, being the continuation of one reproduced in "THE SURVEYOR" of March 19th last.]

In rising to address you for the second time on some of the larger aspects of town planning, I would first of all say that, not only has it given me very great personal pleasure to find that the subject has created sufficient interest to warrant this second meeting, but I feel that, for several reasons, it is most fortunate that we are able to hold it. I suppose that almost everyone here has, at some time or other, either spoken or written on some aspect of town planning, and I am quite sure that all who have done so will have felt the impossibility of dealing at all adequately, even with one small aspect of this great subject, within the space of one lecture or one article, and has been tempted, as I have almost been tempted, to feel that it was so entirely impossible to do justice to the subject under such conditions that we had better not try at all for fear our efforts should simply result in creating confusion of mind as to exactly what the aims and objects of our profession were, and so we might rather tend to hinder than to further the interests which we have so much at heart.

Another reason for taking up this subject again is its extreme importance. Unless we decide first of all what are the broad principles for which we contend, and when we have decided what they are we realise exactly how they are to be attained, all our efforts will be lost in a muddle of small aims and undecided purposes. I would even go so far as to say that, so far, in the town planning movement in this country, this confusion of aims has been more or less paramount, with the result that, to the outsider who sees "most of the fun," we as a body have appeared rather as a set of cranks with "hobbies to ride," who have allowed our discretion to over-ride our prudence, and who imagine that, by doctoring one small sore which has come under our immediate observation in the body politic, we can heal all the ills to which the organism as a whole is subject. No one can deny that the town planning movement in this country is looked upon by many people with the smile of amused contempt, as something quite outside the range of practical politics and hardly worth a serious man's attention, and when we compare this attitude of mind with that prevailing in other countries where the movement is viewed as one with a great future before it, it behoves us to look for the cause and not to rest until we find it. I do not say that the cause which I have indicated is the only one, but I am sure you will agree that it is the largest, and that the only mistake which critics of the movement make is in supposing that all town planners are cranks with "hobbies to ride," whereas they are merely misguided people who are mistaking one specialised line of action along which town planning can move for the great root principle on which it should stand.

My object in these lectures is to show what some of these great root principles should be, and last time I addressed you we dealt with one of these which is so important that it seemed better to devote the whole of our time to its consideration rather than to leave it before I had made myself perfectly clear as to exactly what it is and its relation to the subject as a whole.

THE STRATEGIC FACTOR.

Before turning to consider other root principles, perhaps it would be wise very shortly to recapitulate the conclusions which I sought to arrive at in connection with this portion of the subject. Not only in my lecture, but also in the discussion which followed, I endeavoured to maintain that the location of all cities is first of all strategic, and, as you will remember, I instanced Manchester as an ideal distributing centre, Liverpool as a shipping port, and London as a governmental centre, Oxford and Cambridge, and especially the latter, as originally strategically perfect academic centres. Nature first provided the ideal condition, and science and art have contributed to give these natural advantages their economic value.

I further pointed out that, in speaking of the strategic factor, I did not in any sense intend to confine that expression to its military sense. With this end in view, I pointed out the different, yet equally strategic, locations of our Lancashire cotton manufacturing towns, which are dependent upon a humid atmosphere and ample supply of good water for the development of their industries, necessities which cannot be found in such perfection in any other part of the world, if we except Ireland, which shares with this district the peculiar advantages given to it by the presence of the humid strata of air overlying the Gulf Stream.

You may further remember that I emphasised what I had said with regard to the strategic placing of such towns by some figures relating to Lancaster and to Preston, which, as you know, lie about 30 miles apart on the London and North-Western Railway main line to Scotland, and I showed how the former town suffered from its weak strategic position in relation to the latter in having to pay about £30,000 per annum over and above what is paid by Preston for the same amount of heavy goods traffic. Including parcels and passenger charges, Lancaster is probably penalised to the extent of at least £50,000 per annum, which is equal to a rate of 5s. 6d. in the £.

This one statement is sufficient to justify my claim that the strategic factor is the one most important of the broad principles on which town planning must rest, for when collecting data for a town planning scheme we must of necessity, first of all before anything else study the strategic element, which is so largely a geographical one, for the life of the town must depend very largely upon the freedom with which its raw materials can be delivered and the finished or manufactured or mineral products of the district despatched. Here perhaps I may anticipate one obvious objection to what I have just said. In the majority of cases the location of a city is quite beyond the control of the town planner. Even where he is planning *de novo* on a virgin site, that site is fixed for him, and he has no choice but to adopt it; but I still maintain that this does not exonerate him from the necessity of studying most carefully the strategic factors which govern the town. Thus, in the very instance which I have just been quoting, though the position of Lancaster is fixed and unalterable, and though we cannot place it just as near the centres from which it attains its merchandise or to which it sends its finished articles as its neighbour Preston, much has been done to overcome the consequent defect, in this instance, by the provision of splendid transit facilities within the town, whereby nearly every works or manufactory of any standing has its own railway sidings and often its canal communication as well, and as a result largely of this the Lancaster, Kendal and Preston Canal is a pattern of what the water highways of the country ought to be, if properly planned in relation to the towns they serve and built on a generous enough scale.

However, this is a digression. I must now pass on to consider other root principles governing town planning, but before doing so I would just add a statement which I think will surprise some of you, and especially members of that numerous class of town planners who regard the housing of the working classes as the Alpha and the Omega of town planning. This statement is that it is the perfect strategic position of Port Sunlight for the receipt and delivery of goods, and the consequent vast saving effected in the handling of merchandise, which has made the model village possible. It provided the surpluses which my friend Sir William Lever, with his usual insight and foresight, seized and realised, with a result which has made his notable experiment of world-wide reputation.

Turning, then, to others of the larger problems which confront the town planner, I would mention first of all that most important subject—the provision of cheap power—municipally or co-operatively owned, thus effecting a saving not only in its actual working, but also in the hauling of fuel and the housing of a number of smaller plants, probably also doing away

out rely with the smoke-nuisance. The importance of this matter is so universally acknowledged that I need not enlarge upon it, nor need I enlarge on the desirability of a good water supply and the location which will permit of effective and economic sewage disposal by gravitation without any pumping, nor even on the necessity for cheap heat and light, though possibly these two last are ones which have been brought before me more prominently in my practice than they would be before some members here who had not worked in Canada, where natural gas wells up from the soil, and has only to be collected and distributed, and electric power for light is so abundant that street lighting, for instance, can be carried on on such a scale as Ottawa in a manner which would fill the heart of the English town councillor with envious admiration.

TRAFFIC PROBLEMS.

While exercise will realise at once the importance and the interdependence of all these factors, there is one other factor dependent on them, and on which they equally depend, which has far-reaching influence on the success of any town, the importance of which has never, I think, been fully grasped in these experiments of town planning which have been carried out in this country. I refer to the scientific study of traffic problems and traffic control on an economic basis. In most of the work done in this country it would appear from the result that there has been no consciousness of the tremendous need for full consideration of this most important subject, and even where it has been dealt with it would seem as though the paramount idea of the designer were to lure as much traffic into the roads as possible, whereas surely the opposite ought to be the aim. And yet how intensely vital a subject it is, for without traffic the city, town or village cannot live. If we consider the streets, the [illegible] the buildings of a city, comprising its body-corporate, it remains a dead body without its traffic, just as the human body-corporate would be without the life-giving fluid which circulates in its veins. Traffic is to the town what the life-giving fluid is to the body, and only by its aid can it continue to grow and prosper, or even to exist.

I have had this very forcibly brought before me quite recently in connection with my work at Bolton, in Lancashire, where I discovered that the 146 mills and other works had delivered to them in the course of a year, by different railway companies in Bolton, 580,000 tons of merchandise, together with 220,000 tons of minerals and 845,000 tons of coke and coal, making, altogether, the enormous total of 1,645,000 tons of merchandise dragged through the streets. I should add that these figures do not include anything brought into Bolton by road from Manchester or elsewhere, and the heavy motor-car traffic in the town on this account is enormous. It would not be fair to assume that all such traffic could be carried by rail even if proper facilities for landing the goods right at the works were provided. They include only that which is unloaded from the railway and canals in Bolton itself, and which would certainly go straight through to the works if they had the sidings. Nor do these figures include the 300,000 parcels received and sent out from the different stations in Bolton, some of which might also be delivered in the same way under a better railway traffic scheme; nor do they include the still larger amount of traffic handled by numerous business houses in the retail delivery of goods.

Now Bolton is a town of some 300,000 inhabitants, and it will thus be seen that its traffic along its streets is out of all proportion to its size. What would happen, say, to a town like Sheffield under similar circumstances? Such a state of congestion would exist as would render the proper conduct of any business quite impossible; and mentioning Sheffield reminds me that here we have the opposite state of affairs. In this city (one of the seven largest cities in the kingdom), although there is an enormous trade in extremely heavy goods going on the whole time—not only in the day, but throughout the night—I suppose there is no other city where the street traffic problems are so simple, entirely because this one side of the traffic problem—that is, the provision of proper connection between the works and the railway—is adequately dealt with. Sheffield is not, however, a perfect example of the solution of traffic problems, even only in so far as they affect the railway companies and railway facilities. While this heavy goods traffic is splendidly dealt with, the very reverse is the case with the passenger traffic. Neither of the two big stations is really well placed in this respect, though great efforts are at the present time being made, I understand, to bring the Victoria Station more into the heart of things by the creation of a high-level approach over the congested and poor neighbourhood into which the incoming traffic pours at the present time.

We could, of course, spend quite profitably the remainder of our time this evening discussing this one aspect of traffic—that is to say, the planning and arrangement of the railways and their termini and works sidings in the ideal town plan. There are, however, other equally important traffic problems which also claim consideration, and we must pass on to these; but before doing so I would say that the points I want to make in comparing Bolton with Sheffield are, first, that when you have solved your traffic problems you will have no traffic left, and, secondly, that the question of traffic control is essentially an economic one. Supposing, for instance, we take up for a moment again the figures I gave you relative to Bolton, and supposing we reckon the cost of delivery of the merchandise carried through the streets at only 1s. 6d. per ton. This, I am sure, you will agree, would be a very moderate computation indeed, because it barely covers the cost of the actual carting, quite apart from the loading and unloading, and, of course, goods brought from the station to the works by cart are handled three times instead of once. We shall find that at the price I have quoted—that is, 1s. 6d. per ton—we have the enormous cost of £123,375 spent on carting alone, all of which is of a nature which might be avoided, and if we capitalise this on a 5 per cent basis we have nearly £2,500,000 capital, the interest of which is being expended on what is really useless labour. Again, this allows nothing for the extra wear and tear on the highways, so that, if we even spent the whole of this large sum —£2,500,000—in railway sidings, and so on, we should still be enormously in pocket. Put into other terms, Bolton pays equal to a rate of 3s. 5d. in the £ in a rateable value, and this quite apart from maintenance charges for the road

I must, however, pass on

DIVISION OF TRAFFIC.

The most obvious thing to do when taking up the study of the traffic problems of a town is to divide it into radial and gyratory traffic, for, as most of you are aware, the wheeled traffic in almost any town may be divided up into three-quarters of its entire bulk which proceeds in a radial direction, either to or from the centre of the town, and the remaining quarter which gyrates round that centre. This obvious and simple expedient at once brings a semblance of order out of the chaotic mass of vehicles of all kinds which appear to be rushing indiscriminately in all directions, and gives us some hope of bringing the whole down to a scientific basis; for, of course, the aim of the scientific town planner is so to plan his traffic streets that they exactly follow the lines of the bulk of the traffic which is to occupy them. This would all seem very obvious, and I would not have mentioned it but for the fact that I find so very many people who so far fail to realise it that they consider that, for utilitarian purposes, we could have no better plan than the American square block plan, in which every street runs at right-angles to every other, and in conversation with them I have discovered that they considered that, in this respect, there was rather the conflict between æsthetic and practical ideals.

Now here, if there were time, I should like to enter on an intensely interesting argument which I have sustained on more than one occasion to prove that there never can be any conflict between the practical and the æsthetic. In those cases where there appears to be such a conflict it is either because our practice is not truly practical or our æsthetics are false; but all of you, I suppose, will be with me here, and especially those of you who have endeavoured to produce beautiful architecture, not by the addition of superimposed ornament, but by the correct disposition of parts and proportions, so I need only say that what you have found such an engrossing method, and one which promises such exceptional results, is equally applicable to the solution of traffic problems. At first sight this may seem a very bold statement to make, but before you have proceeded far with the study of the subject you will see that those lines which are good for traffic are the graceful lines, that where traffic converges, if the necessary open space is planned with due regard to the division of streams of traffic and the preservation of lines of vision, it will not only lend itself to fine architectural treat-

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ment, but will be such as almost to compel such a treatment, and to make its adoption self-evident. . . .

CO-OPERATION AND COLLABORATION.

This brings me to another great principle in town planning, which is so important that it would be absurd to omit all reference to it on an occasion like this, but which, I fear, we have not the time remaining to deal with it at all adequately; this is the great question of co-operation and collaboration between the various men who are to plan the city. I am afraid we do not all realise what ought to be perfectly self-evident, and that is that no one man can, in the space of his natural span of existence, attain to sufficient knowledge of all the many component subjects necessary to allow him to plan a city, from the cutting of the first sod to the choice and selection of the personnel of the municipal brass band. Generally, in this country, it is assumed that each town plan should be the work of one man; but this, really, is absolutely absurd. Between the two extremes I have mentioned, which form the first necessity and the last luxury of city formation, comes a vast agglomeration of specialised efforts which must entail the services of many experts, and it is usually assumed that the final oversight, the last word, must necessarily be placed in the power of one of them. Writing in the *Town Planning Review* some time ago in connection with an article on this very subject, which I wrote for it, Prof. Adshead said: "In England there still exists a great variance of opinion as to which profession most nearly possesses the necessary qualifications. The real issue lies between the architect and the engineer, while surveyors, landscape architects, and sociologists have certainly a voice in the matter." He then went on to suggest a kind of compromise. The surveyor is to have control during the preliminary work, then the engineer is to be in command, and finally the architect is to take possession of the field, and furnish the plan with buildings. This point of view is, I think, a very typical one, which must be my justification for taking it up for criticism.

I cannot but feel that the greatest end of town planning cannot be served by such a compromise. The one point above all others which its advocates have insisted upon is that continuity of policy from start to finish should be assured, and this cannot be if each specialist is to be in control in turn, however much he may be guided by others whose spheres interlock with his. This brings us to the inevitable conclusion that there must be some person whose training has been not that of a specialist, but of that general nature which will place him in sympathy with all the specialists employed, to exercise the judicial faculty, to co-ordinate and correlate the work of each, and to see that every interest is adequately met; and this is the person who, for lack of a better name, I would call the "landscape architect."

I am afraid that, in advocating this here in England, I am asking too much. I am afraid that so far our outlook in town planning matters has been so narrow that we have each, in effect if not in words, cried out, "I am the man," if we have not added "and wisdom shall die with me!" I would feel repaid for the effort of a hundred such lectures as this if I felt that by giving them I had done something towards the creation of a sympathetic attitude on the part of each of those concerned in the planning of towns towards the work of others, and if I could feel that there was a state of mind taking shape and growing up which would lead ultimately to happy co-operation and collaboration between the architect, the surveyor, the engineer, the cheap cottage expert, the municipal architect, the school architect, the sociologist, the organised play expert, the factory designer and inspector, and every other interest which would allow them all to work in happy collaboration, and finally to report to a man who has a knowledge of every interest in the round sufficient to allow him to correlate the whole. This man we might call the town planner or the landscape architect; but to choose such a man because he is an expert in any one of these directions more than another would, I am sure, be fatal to success.

Chester Tuberculosis Pavilion.—Erected at a cost of £1,750, in the grounds of the isolation hospital on the Chester Corporation's estate at Sealand, a tuberculosis pavilion was formally opened at Chester on Monday. It consists of two wings, one for men and the other for women, and will serve the city and district.

TOWN PLANNING IN CANADA.

RECENT PROGRESS.

An Act has been passed in Nova Scotia which entitles that province to the claim that it has the most advanced legislation in the world in connection with town planning. The Act has been framed on the precedent of the British Act of 1909, but goes much further. A town planning controller has to be appointed by the Commissioner of Public Works for the whole province, and every city, town and municipality (which includes county areas) must appoint a town planning board. The board will consist of the mayor and two members of the council, together with not less than two ratepayers, to be appointed for three years. It will have power to acquire and dispose of lands, and has to appoint a town planning engineer, architect or surveyor.

No street, road or public right of way can hereafter be laid out, and no tract of land can be subdivided or sold as lots unless in accordance with plans and particulars approved by the local board.

Within three years every local board must either prepare a set of town planning by-laws or a town planning scheme. If by-laws are prepared they have to include provision for dealing with the matters set out in Schedule A attached to the Act, which include the following minimum requirements:—

(1) The distance between buildings to be not less than 60 ft. and up to 100 ft. on opposite sides of existing streets, both in respect of new buildings and reconstructed buildings, and to be not less than 80 ft. on new main thoroughfares, whatever the width of the street.

(2) Land to be reserved for new main thoroughfares not less than 60 ft. in width, and provision made for allowing narrow streets of from 24 ft. to 40 ft. where not required for through traffic.

(3) The number of dwellings to be limited on each acre, all windows of dwellings to have adequate light and air, separate areas to be prescribed for dwellings, factories, stores, &c.

The whole province will be subject to the by-laws dealing with the above matters, except in respect of those areas which are dealt with under schemes.

The procedure in connection with the preparation and approval of the scheme largely follows the British practice. A scheme may be prepared, however, with respect to any land—that is, there is no distinction between land not yet built upon and land already built upon. A scheme may also be altered or revoked without the necessity of preparing a subsequent scheme.

Under the compensation clauses, sub-sections have been added to deal with injurious affection and "betterment" as a result of the execution of a scheme, as well as the result of making a scheme.

The local board may not only purchase land for some direct purpose of the scheme, but also land within 200 ft. of the boundary lines of any street laid out, widened or improved by the board, or any park, playground, or other open space which it acquires under the scheme.

The provisions of the British Act dealing with regulations, general provisions, contravention, compensation and methods of enforcing have been adopted, and apply to by-laws as well as to schemes.

The Commissioner of Public Works will probably prepare a model set of by-laws, so that the smaller municipalities will be able to deal with the matter at the minimum of labour and expense. Although the Act provides that local authorities can include land outside their area in their schemes, the fact that the whole province will automatically come under the control of town planning by-laws will reduce the necessity for using this power, and thereby prevent possible friction. It is hoped to get the other provinces in Canada to adopt similar legislation in the near future.

NEW BRUNSWICK.

Although Nova Scotia has now the most advanced Act, New Brunswick is likely to be the first province in which a town planning scheme is prepared. The city of St. John has appointed a Town Planning Commission to prepare a scheme under the New Brunswick Act of 1912, and a map is being prepared for an area of about 10,000 acres.

In many other parts of Canada progress is being made with town planning, but the Maritime Provinces have so far gone furthest in regard to legislation and its practical application.

Construction of Storage Tanks in Peat.*

By HAROLD N. ALVES, [illegible], Resident Engineer on the recently completed Glastonbury Sewage Works.

[illegible] to [illegible] ried out than a treatise on the subject in general.

The writer, acting as resident engineer on the works, had every opportunity of closely studying the peculiar characteristics of peat.

In the first place it is, I consider, absolutely im[illegible] methods of construction in or on the peat, there being such a variety of peats, each having its own peculiarity and requiring suitable treatment.

As an example, the peat in which the storage tanks are constructed is entirely different from that in which the outfall works are built, and this also is very different from peat around Ashcott and Shapwick. There is also a great difference in each stratum of peat. At Porchestall the top stratum consists largely of alder and oak. The next is bracken and small undergrowth. This extends to 19 ft. below the surface, a 5-ft. bed of lias clay comes next, and below down to 30 ft. deep is a dryer layer of black peat consisting chiefly of hazel and small underwood. Shells of the hazel nut were found in great quantity.

The layer of clay found at 19 ft. is in a soft or viscous condition, which, though rapidly hardening when brought into contact with the air, is not stiff enough to carry weight, and piles are easily driven through it. The clay at 30 ft. is similar, but is stiffer as the depth increases, and at 40 ft. is quite a laminated marl formation.

[illegible]

Briefly the history of the construction of the Glastonbury outfall sewage works is as follows:—

[illegible] storage tank to accommodate 75,000 gallons which, by its unusual shape, should support itself in the peat, relying not on any definite or piled foundation, but floating, as it were, in the soft peat. This may or may not have happened, though had the tank been successfully constructed one wonders what would have happened when the tank was pumped out, the action being similar to the pumping out of the water-ballast tanks in submarines with subsequent rising of the vessel.

The top of the tank was intended to lie about 8 ft. below ground level. Excavation was therefore made the area of the tank, 53 ft. diameter over all, and 8 ft. deep. To relieve the pressure on the sides the excavation was sheared down at an angle of 45 deg.

At this depth the peat inside and outside the hole stood practically steady. Any attempt to get below this depth met with failure, the soft peat rising almost as rapidly in the bottom as the excavation was made.

Complete wooden frames were then made to enable the excavation for walls to be taken out in sections, the idea being to take out the peat and drop the concrete in. In this case the pressure of the peat was under-estimated, and the frames buckled.

At this juncture the diameter of the tank was decreased, and the depth increased accordingly, it being thought easier to deal with a smaller area. The contractors also decided to enclose this area with corrugated sheet steel interlocking piles of $\frac{3}{16}$-in. gauge. This was done, the piles being driven to about 20 ft. below the surface. A stout timber frame was fixed, and excavation recommenced.

Before a sufficient depth of peat could be got out to fix a second timber frame the sheet piles began to assume a shape very different to the original circle at which they were driven; the peat in the bottom of the excavation began to rise rapidly over the whole area, but more in the middle than at the sides.

The ground also 70 ft. to 80 ft. around the excavation sank from 6 in. to 18 in.

During the whole of the time these operations were in progress water was making in the excavation in sufficient quantity to keep a No. 4 Pulsometer pump going at full pressure.

Operations were now suspended to consider whether it was advisable to proceed with the work at this spot or seek a more suitable site. To ascertain if the belt of clay had been forced up, a 4-ft. diameter concrete tube was sunk as a caisson in the bottom of the excavation. It was found that the clay had risen as much as 4 ft. in the centre.

It may be argued that, if the sheet piles had been driven into the lower lias clay 30 ft. deep, the work would have been successful. The writer is, however, of the opinion that the pressure below the excavation would have been too great for the piles to withstand it.

While the question of altering the site for the storage tank was being considered by the engineer, the contractors were commencing the construction of the outfall tanks, and as it was certain that the same difficulties would be met with as at Porchestall, it was decided to form the lower cylindrical portion of the settling tanks as caissons in the manner described by the engineer. These tanks are described as being in a floating condition, but I do not think this is at all feasible, or there would certainly be an upward as well as a downward movement. There was certainly a downward movement, and this continued until the peat below the thin belt of clay on which the bottom of the tanks are resting was sufficiently consolidated to withstand the pressure.

It must be borne in mind that the peat below this clay is dry and solid as compared with that above, the clay belt acting as a waterproof covering.

In constructing these tanks the greatest difficulty experienced was that of getting the caissons to stop at the right level for inserting the plank bottom. This was partly done by hanging the concrete rings to timber baulks stretched across the hole on the ground level with strong pulley blocks and chains.

Even after the planking was in place the downward movement went on, and continued right through the construction of the upper circular and octagonal portion. This necessitated the use of a good deal more concrete than was originally intended, and resulted in deeper tanks than shown on the contract drawings.

This caisson construction of the 12-ft. tanks having proved a success, the engineer decided to construct the storage tanks at Porchestall in a similar manner; 15 ft. was the diameter decided upon, and to obtain the necessary storage three tanks, 40 ft. deep, had to be constructed.

The three caissons were formed simultaneously, one ring sunk while the other two were being added to or allowed to set. These rings, on account of their great weight, would sink 9 in. to 12 in. while fresh rings were being added, the concrete sliding through the moulds on the surface. This did not in any way injure the joint or allow the ingress of water, and the whole operation was carried out successfully.

The bottoms were put in without the need of planking, as the lias formation at 40 ft. deep was very hard and dense.

In one of the tanks a spring was found in the bottom. The difficulty of concreting on this was got over by placing loose stones around the spring, and a 2-in. pipe was placed in the centre and the pump connected thereto, and kept going until the concrete floor had set. The pump was then disconnected, and the pipe capped.

* Paper read at a meeting of the Somerset Surveyors' Association at Glastonbury last Saturday.

Town Planning Institute.—The annual meeting of this body has been fixed for the afternoon of Wednesday, June 23rd.

Motor Fire Engine for Rochester.—Efficient fire protection in our cathedral cities is an undoubted necessity, and nowadays, in order to be absolutely up to date, a motor fire engine is a *sine quâ non*. Rochester is the latest cathedral city to take this matter into serious consideration. Here the authorities, after weighing the respective merits of the reciprocating and turbine type of pump, and witnessing tests of both designs, have decided in favour of the Merryweather "Hatfield" reciprocating pump. The order has accordingly been placed for a petrol-driven motor fire engine of this design, with pump to deliver 350-400 gallons per minute. A 50-ft. fire escape will be carried, and ample accommodation will be arranged for hose and gear, while in all respects the machine will be provided with up-to-date improvements. Other cathedral cities having the "Hatfield" type of motor fire engine in actual service are Exeter, Norwich and Carlisle.

Institution of Municipal and County Engineers.

MEETING AT SCARBOROUGH.

(Conclusion.)

We reproduce below the concluding passages of the paper which Mr. Harry W. Smith, ASSOC.M.INST.C.E., the borough engineer, presented at the recent meeting of the Institution of Municipal and County Engineers in Scarborough. The subject of the paper, it will be recalled, was

CATERING FOR THE WANTS OF THE HOLIDAY MAKER.

The Mere is a sheet of water some 10 acres in extent, surrounded by walks and shrubberies. In 1913 the council fitted out a fleet of boats and canoes and established a small cafe. This has proved to be a sound venture financially, although the Mere is situated in a rather "out of the way" locality.

The waters are stocked with coarse fish, and a charge of 6d. per day is made for fishing.

It is at the Mere that the author deals with the problem of refuse disposal.

An extension which will practically double the water area is now in hand, and the banks and roadway surrounding the same are all formed of house refuse.

The author does not claim this to be the ideal method of dealing with the refuse question, but it certainly is economical, and the ultimate result is an asset of considerable value to a pleasure resort. The cost of disposal only by this method is about 7¼d. per ton.

The method adopted is to dump the refuse into a series of hills and valleys, avoiding any appearance of embankment as far as possible, and then covering with from 1ft. 6in. to 2ft. of top soil excavated to form the lake. This is left for about six months, and at the proper season covered with cuttings of various shrubs and trees. These root rapidly, and by the time the excavations are ready to receive the water the banks will be entirely clothed with vegetation.

All the works described in this paper, with the exception of builders' work, have been carried out by direct labour.

TENNIS.

In addition to the provision made for tennis in the public parks and pleasure grounds the town council have constructed sixteen courts on a portion of their Weaponness estate, and leased them to the Yorkshire Lawn Tennis Association, who have erected a very handsome and commodious pavilion. Surrounding the courts are walks and shrubberies, open to the public and maintained at the cost of the council. It is on these courts that tournaments are played.

GOLF.

The provision of a golf course is of first importance to a pleasure resort, and there is much to be said in favour of the same being provided by the municipality.

From information obtained by the author from other towns, it would appear that when this is the case the charges made in connection with such a golf course are considerably lower than is the case when golf is run by private enterprise. At the same time it is also true that in practically all such instances very little has been paid for the land upon which a course may have been formed, waste or common land of little use for agricultural purposes being utilised in most cases.

Although the powers given by the Public Health Act are sufficiently wide as to enable a municipality to acquire land for the purposes of laying out and running a golf course, additional power appears to be necessary to enable a charge to be made for the use of the same; without such power, the provision of a golf course would be a very heavy burden on the rates.

To the mind of a great majority of the ratepayers, golf is a game for the "idle rich," and the promotion of a Parliamentary Bill having for its object the provision of a golf course might be easily wrecked at its inception if a poll of the ratepayers were demanded.

Scarborough has had before it the question of the provision of a golf course for some years, and is still seriously considering the matter. In the meantime the council have leased corporate land to private clubs, who have established an 18-hole course on the South Cliff, and a 9-hole course on the North Cliff, both of which are of an undoubted benefit to the town and have done much to educate the ratepayers as to the value of golf to a pleasure resort.

Ganton, possibly one of the finest of our inland courses, is within 10 miles of Scarborough.

In conclusion, it may not be altogether out of place to add a brief description of the bombardment of the town by the German Fleet on the morning of December 16, 1914, as, on the principle of making "the best of a bad job," it is hoped that the damage wrought to the walls, keep, and barracks on the Castle Hill will remain untouched, as a standing memorial of "German Kultur," and, incidentally, a source of revenue to the corporation from the holiday maker.

The battleships commenced firing from the North Bay at 8.5 a.m., steaming southward; the firing continued for about twelve minutes, when there was a lull of about five minutes, during which the ships turned round and headed northward; they commenced firing as soon as they had turned, and finished at 8.35 a.m. In this short period somewhere between 500 and 600 shells were fired, the projectiles consisting of 3 in., 6 in., and 11 in.; of the two former a number were found unexploded, but with regard to the latter, fragments only have been found. There is evidence of common shrapnel and armour-piercing shells having been fired, one, probably of the latter variety, being embedded in the sea wall of the Marine-drive to a depth of 10 ft.

From a plan showing the positions struck by the shells, prepared by the author, it would appear that the points receiving chief attention were the coast-guard station, and Old Barracks on the Castle Hill, the wireless station and storage reservoirs on Oliver's Mount, and much of the damage wrought in various parts of the town resulted from bad shots aimed at these points. The heavy damage wrought to the Grand Hotel and the South Cliff may be attributed "to the general policy of 'frightfulness.'" In all, some 209 buildings were damaged, including many private dwelling-houses, ten public buildings, seven churches, five hotels, &c. Nineteen people were killed, and about eighty-four injured. Some of the shells fell inland 4½ miles. During the firing a section of the fleet were engaged in laying an extensive mine field, which resulted in the blowing up of a number of vessels and the loss of several lives.

DISCUSSION OF MR. SMITH'S PAPER.

Mr. F. MAGGS (Wakefield), in proposing a vote of thanks to Mr. Smith, said he was sure they were all indebted to the latter for the trouble he had taken in preparing the paper and for arranging the meeting. While he was not quite sure that he did not like Scarborough five years ago better than he did now, he realised that it was necessary that something should be done to combat the erosion of the coast that was going on, and he felt that all that had been done had been carried out with a due regard for the preservation of the natural beauties of the place.

Mr. W. J. STEELE (Newcastle-on-Tyne), in seconding, said a perusal of the paper and accompanying drawings showed the real engineer or architect that Mr. Smith had taken advantage of the natural configuration of the district in any work that he had carried out. If they looked at the plan of the bathing pool, or of the gardens, they would see that by getting hold of a wrong conception those works might easily have been ruined; but Mr. Smith had taken advantage of the slope and the vistas, and, one could see, had brought out the natural points of the district by assisting them, and made the whole scheme quite good. One often saw in places that were supposed to be made beautiful too much artificiality. There was nothing more depressing and ugly than a structure which was at all out of keeping with its surroundings. Take a little valley with a river running through it, where they saw one of these horribly ugly ferro-concrete bridges; whereas, if a stone bridge had been constructed it would have been in keeping with the surroundings. To put up these things because they were the fashion was utterly wrong. The main principle which Mr. Smith had attempted, and very success-

duly carried out, was to help what he found on the ground. That, to his mind, was the greatest testimonial that could be paid to any man who had carried out work that he had got a proper conception of what he was set to do.

The vote of thanks was carried.

In replying Mr. Smith said it was with the very greatest pleasure that he welcomed the institution to Scarborough again. The last eight or nine years had been very busy years indeed. The borough boundary had been extended, they had a town planning and housing scheme on the way, and many other important works, including street improvements. But possibly they had devoted the bulk of their energies to bringing Scarborough up to date and on a par with other pleasure resorts. The latter were continually going forward, and they intended to keep pace with them. He had endeavoured as far as possible not to destroy the natural beauties of Scarborough. He appreciated them because as much as anyone, but there were points at which they could not leave the cliffs as things were—much as they would like to. The cliffs at the best were formed of very varying strata, but largely of soft sandstone overlying shale. There was considerable erosion at the foot from the sea, and any number of land streams, and if they were left alone the cliffs came down. He would show them on their visit what took place the previous week, and they would see how necessary it was to protect the cliffs. He would much rather have a sandstone cliff than a concrete wall, or a stone wall, or anything of the kind, but this work had got to be done in places, and they would see how necessary it was to protect them. He had done his best to make the work harmonise with the surroundings. The chief work was the South Cliff Gardens. The diagrams would give them some idea of the problems one had had to tackle. They were very fortunate, however, in regard to the ground, for some twenty or thirty years ago the then owners planted it very extensively with trees, and that had helped enormously. He had cut down a few trees, but planted a great many more, and carried out very extensive drainage works. The abnormal rainfall of the past winter had increased their difficulties. The beginning of the winter found them with the cliff all stripped bare and re-modelling down, but they had now almost got the matters over it. He had hoped to be able to show them the bathing pool more nearly complete, but the powers that be had put their foot on them and they had been compelled to slow down. But he thought that when completed the pool would not only prove a source of attraction to Scarborough, but revenue producing. Members would observe from the paper that many of the works mentioned were revenue producing; some might not be bringing in much money, but they were at any rate paying their way. The Alexandra Gardens was a piece of land from which they used formerly to get a rent of about 50s. a year for grazing donkeys. They got a good deal more from it now. He had no doubt that the Floral Hall would have realised £1,400 for concerts this year but for the war. The Peasholm Park was a piece of Nature, but there used to be pig-sties and hen-coops on it. On the west end he had endeavoured to make the best of the water available. One feature was the use they had made of their house refuse. They had no refuse destructor in Scarborough, and it did not seem as if they would have for many years to come. Practically one-third of that lake was made from the contents of the ashbins; but if properly treated it could be made a thing of beauty. That park was only in its infancy. There was another bit of Nature—a glorious bit—he was going to trim up, and he hoped he should not misuse his opportunity. Then there was the piece under the Undercliff. The corporation main sewer ran under it, and the sewer had become out of repair and an eyesore. They put a wall in front of it, and erected a lot of bungalows, which had been immensely popular. He had seen bathing bungalows in other places, but they were usually put up higgledy-piggledy. They cost from £28 to £50, and they got varying rents, from £5 to £14 a year. It was not really so much the rental, which covered the outlay, but the enormous amount of pleasure it gave to a seaside holiday. Parents could take the children to the beach and stop the whole day there. They were considerably extending the number of them. There was a good demand for them, and he had no doubt they would be equally as popular as the present bungalows. Mr. Smith went on to recall that the last time the institution visited the town the authorities were in terrible trouble with the Marine-drive. Along with Mr. Walker, the engineer to the Tyne Commissioners, he suggested certain measures, but the council would not provide the money. Accordingly they adopted another form of repair, which so far had succeeded very well. The method adopted was a series of concrete toes extending along the damaged length of the wall, with an extensive apron in between. In conclusion, Mr. Smith referred to a number of shells which were exhibited on the chairman's table. These were among those that failed to explode on falling during the bombardment of the town, and it was probably, he observed, the first time in the history of the institution that the president had been supported by such grim souvenirs.

After tea the PRESIDENT said that Mr. Smith might tell them how he made the bottom of the pool watertight.

Mr. SMITH: By puddle. The bottom of the lake was clay puddle. Where the refuse was tipped in at the eastern side that was a clay bottom; otherwise they would have had a little trouble with the filling.

Mr. DYER (Bridlington) asked whether the puddle was 2 ft. thick.

Mr. SMITH: Certainly, and perhaps a little more. There was not a single leak.

The PRESIDENT: You have not a large amount of water coming down?

Mr. SMITH: No, except in the case of snow; a fair quantity comes down after snow. He was sorry they were unable to take members to the Mere. It was a larger sheet of water, and they would have seen the raw material there. That was part of a rather ambitious scheme for a lake of 16 or 17 acres of water interspersed with a number of islands. The cost of refuse disposal was very low, and included putting it in place and covering it with surface soil.

The PRESIDENT asked how often they proposed to empty the bathing pool.

Mr. SMITH replied that that would be a matter of experience. Personally, he thought it would be unnecessary to empty it at all. At high water it was seldom that the sea would not wash over it. It would thus get a freshening up at every tide.

A collection for the Orphan Fund of the institution taken in the course of the meeting realised a sum of £2 11s.

ARTERIAL ROADS IN GREATER LONDON.

THE SOUTH-EASTERN SECTION.

On Wednesday at the Local Government Board offices, Whitehall, Mr. G. W. Hume, K.C.C., took the chair at a meeting of the South-Eastern Section of the Committee formed for the consideration of arterial roads in Greater London.

In opening the proceedings the chairman made reference to the death of Mr. J. Rush Dixon, borough engineer and surveyor of Woolwich, who was a member of the section. He was sure, he remarked, that those who had been working with Mr. Dixon on the Investigation Committee realised what a valuable colleague they had. Mr. Rush Dixon had his heart in the work, and he would have been of special use to them when they came to deal with details, including the question of price. He moved that a vote of condolence be sent to the family. Mr. E. van Putten, borough surveyor of Lewisham, seconded, and in doing so associated himself sympathetically with what had fallen from the chairman.

The conference then proceeded to consider the report of a sub-committee on the subject of the proposed arterial roads, and adopted a recommendation as to the desirability of preparing preliminary estimates as soon as possible of the probable cost of the proposed improvements in order that, in the event of unemployment, following the war or otherwise, information as to a useful outlet for labour might be available.

The conference adopted, in an amended form, a proposition by the sub-committee that powers should be given to county councils, after consultation with the local authorities concerned, to prescribe building lines to existing roads, subject to an appeal to the Local Government Board.

The reports submitted included particulars of the routes proposed for the new arterial roads from Old Kent-road to Catford, Bromley by-pass, Eltham by-pass, and the South Circular Road.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

Mr. ERNEST W. PUGH, of Southampton, to whom the premium for April was awarded, has selected Taylor & Thompson's "Concrete, Plain and Reinforced" (Chapman & Hall, Limited), and a copy of this work has been duly sent to him.

QUESTIONS.

This week answers are invited to the following questions:—

474. Roof Truss.—When one end of a steel roof truss is supported on roller bearings, what provision is made to counteract the movement and to prevent damage to the slates and timbers? How would any movement in the truss affect the roof covering? How much is a 50-ft. span roof likely to move? ("T-Square.")

479. Reservoir Dam.—Give sketch and description of an earth embankment, with clay puddle across a mountain brook 12 ft. wide, rising from each side of brook 1 in 2, the embankment to be 12 ft. high in [illegible]. (R. P. M., *Tregyn.*)

480. Sewer Survey.—It is required to survey the course of an old brick sewer, 5 ft. diameter, which runs for 1,000 yds. in a very irregular line in a thickly populated district. There are no available manholes. How can this be done, and what instruments would be used? (W. S. W., *Chesterfield.*)

481. Water Towers.—What are the objects of water towers, and how did they originate? Is there any book dealing with this subject? ("Rewot.")

482. Bridge Construction. How are the angles of the four wing walls of a bridge and the horizontal angle between the bridge and each wall determined? [illegible].

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the 'Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

477. Levelling.—In a series of levels, if the first back sight read 3·25 on an ordnance bench mark of 28·30, the sum of the back sights be 12·95, and fore sights 17·20, what will be the ordnance reading of the last fore sight? (E. W. P., *Southampton.*)

[illegible] reply to this question has been received since our last issue.

If the sum of the back sights be subtracted from the sum of the fore sights, we shall get the total fall—viz., 17·20 − 12·95 = 4·25 ft. fall from B.M. to last [illegible]. We are given the B.M. = 28·30. ∴ ordnance reading of last fore sight = 28·30 − 4·25 = 24·05. [illegible] this result.

We start with the ordnance B.M. of 28·30, the first back sight is 3·25; ∴ 28·30 + 3·25 = 31·55 = the height of the level and first front reading. We are given that the sum of the front sights = 17·20; let us assume that the first front sight is 8 ft. and the second 9·2 ft. 31·55 − 8·00 = 23·55 = ground level and first front sight or second back sight. We are also given that the sum of the back sights = 12·95, and first back sight = 3·25; ∴ second back sight = 9·70.

23·55 + 9·70 = 33·25 = second height of level. 33·25 − 9·2 = 24·05 ground level at last fore sight. (J. W., *Leeds.*)

478. Levelling.—It is required to find the difference of level of two pegs on opposite banks of a river, and it is known that the collimation line of the level you have to use is out of adjustment. How would you find the difference of level required? (E. W. P., *Southampton.*)

The following additional reply to this question has been received since our last issue:—

To find the difference in level of two pegs on opposite banks of a river, with a level known to be out of collimation, have two additional pegs driven in exactly opposite each other, and to the precise level of the water in each case. Set up the level and take the readings of the peg A on the bank and the peg C at the water level on this side of the river, and also that of the peg D on the opposite side.

Now the pegs C and D must be at the same level, and the difference in their readings gives the error in collimation. The reading on peg B should then

be taken, and by calculating on the basis of the error found to exist its level compared with A may be accurately determined. If it be possible to cross the river with the level, or if the distance be so great that the staff could not be distinctly seen, the levels could be taken on peg A and C; then be setting the level up on the other side of the pegs B and D, in which case the difference of the pegs on the bank above those of the water would be given, and from this the comparative level of A and B could be found. ("T-Square.")

481. Testing Materials.—Mention some tests by which we can estimate or measure the ductility of metals, and some of the reasons which make it important to obtain a test of this property. (A.M.I.C.E.)

The most important tests are as follows: (1) A test-bar of the material is hammered when cold in such a way as to bend it through an angle of 180 deg. A very usual requirement in specifications *re* the ductility of a metal is that the metal shall withstand this test without cracking or splitting at the bend,

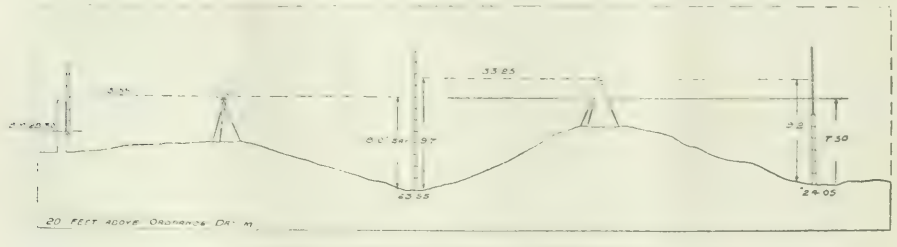

DIAGRAM ILLUSTRATING REPLY TO QUESTION 477

the diameter of the bar being specified. (2) A test-bar is hammered when cold in such a way as to reduce its cross-sectional area. This also must be accomplished without cracking, the amount of reduction

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Contracts Open

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Brampton R.D.C. (May 11th. Mr. A. G. Drury). £3,600 for a water supply for the parish of Cumwhitton, including the townships of Northwaugh and Moorhouse. Mr. W. Wallis, engineer, Newcastle-on-Tyne, who prepared the scheme, stated that the assessable value of the parish for sanitary purposes was £2,065, and a penny rate would produce about £9 for waterworks purposes. The existing water supplies were anything but satisfactory, being chiefly obtained from local brooks and springs, while the fields in numerous instances are without any source of water supply whatever. Briefly put, the scheme consisted of taking water from the springs, whence it will gravitate to a service reservoir, from where distributing mains will be laid along the road to Cumwhitton village. The minimum flow of the springs is about 20,000 gallons a day, and as a maximum of 10,000 gallons only is required for the district there will always be a continuous flow of water down the existing stream. The water will be taken as "underground water," and anything in the nature of taking flowing water in a defined course will be most carefully avoided. Any excess of water not required for the district will pass over the overflow into the existing stream. The springs issue at a level of 570 ft. above sea level. They will therefore be able to supply the greater part of the inhabited district of the parish by gravitation, and no pumping will be necessary. The cost is estimated at £3,600.

APPLICATIONS FOR LOANS.

Derby T.C. £5,057 for the electricity undertaking.

Goole T.C. £6,000 for a sewerage scheme.

Ipswich T.C. £5,200 for the extension of the refuse destructor.

Middlesbrough T.C.—£3,000 for electricity mains and house services.

Portslade U.D.C.—£1,300 for works of surface-water drainage.

Salisbury and District Joint Hospital Committee.—£1,500 for hospital extension.

Tees Port Sanitary Authority.—£2,250 for the removal of the floating hospital to another site.

Wigan T.C.—£987 for additional expenditure on double deck tramway cars.

LOANS SANCTIONED.

Girvan T.C. £1,030 for works of road improvement.

Goole U.D.C.—£600 for the provision of a cooling-house at the public slaughter-house.

Rotherham R.D.C. £402 for sewerage works.

Woolwich B.C.—£35,000 for electricity purposes.

Yarmouth T.C. £800 for cemetery extension.

FORTHCOMING INQUIRIES.

MAY.	£
25.—**Newbury.** For the provision of workmen's houses (Mr. Courtenay Clifton)	1,800
25. **Shrewsbury.** For the provision of aeration plant (Mr. R. H. Bicknell)	1,070
26. **Eccles.** For the purposes of an improvement scheme (Mr. Edward Leonard)	
26.—**Dinas Powis.** For the provision of a burial ground (Mr. R. H. Bicknell)	2,000
26. **Stafford.** For works of sewage disposal (Mr. A. G. Drury)	19,000

Bath and West and Southern Counties Society's Show. Messrs. Marshall, Sons & Co., Limited, Gainsborough, are among the exhibitors at this show which opened yesterday at Worcester. All their exhibits, which are on Stands Nos. 87 to 90, Shed No. 21, disclose features of careful design and excellence of workmanship which are so characteristic of this well-known firm. The machinery comprises a steam tractor, a traction engine, two threshing machines, and an elevator. Two "Marshall" oil engines are also on view, and these demonstrate that the firm can produce high-grade internal-combustion motors of a type which bids fair to earn as high a reputation for excellency of design as has been attained with their world-famed portable steam engines.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is not the death of Mr. Rush Dixon, M.Inst.C.E., the borough engineer of Woolwich, a sad loss to the municipal engineering profession? Was he not well known as a man of eminent professional ability and skill, and one who kept himself well to the forefront in all things pertaining to municipal engineering and its multifarious ramifications? Shall we not all miss him very greatly, and heartily sympathise with his widow and daughters?

* * * *

Would not the report of the Civil Engineers Appointments Board, recently issued by the Institution of Civil Engineers, have been of more interest if the board could have stated the number of appointments they had secured for the applicants who had registered their names on the books as requiring employment? Does not this omission make the report of little or no interest? And does it not also give opportunities for critics to wonder if the board has been as useful as it was hoped it would be when it was first constituted?

* * * *

Are not the council of the Institute of Sanitary Engineers to be congratulated on their report for the year 1914, which shows how greatly the position of this useful institution has improved during the last few years? Is it not satisfactory to learn that the liabilities have been reduced by £400 during the past four years, and that the deficits which existed for many years are now changed to a surplus of over £216? Should not all sanitary engineers loyally support this institution by enrolling themselves as members, and take an active part in the proceedings?

* * * *

How is it that the Engineering Unit of the London National Guard is not receiving the support that would be expected if the engineers practising in London were more keenly alive to the grave danger in which this country now stands? Is it not almost to be regretted that this country has no frontier that can be attacked, and that we are apt to be lulled into a state of dangerous inactivity? Are engineers so busy that they have no spare time? Or what is the reason that so many are standing aloof from joining this useful and valuable adjunct to our Regular Army?

* * * *

How long will it take H.M. Office of Works to realise that water-bound macadam roads are now somewhat out of date, even for pleasure traffic, and would it not be well if some of their engineering advisers learnt something of the principles of road making?

* * * *

Are there not still a large number of young able-bodied men in Government offices whose work might easily be accomplished by women, or old men, and their services given in fighting for their country? Is it not a fact that at the present time one soldier is worth any amount of civilians unless the latter are engaged in connection with the supply of munitions? Do we yet quite realise that nothing except fighting is going to bring the war to a close?

Welsh Tramway Bills.—The Tramways Extension Bill of the Rhondda Urban District Council has been sent by the Examiner for second reading in the House of Lords. The Bill has been through the Commons. The Aberdare Urban District Council Tramways Bill, which has passed the Lords, has been ordered for second reading in the Commons.

Treasury Committee and London County Council.—In the House of Commons Mr. Chamberlain asked the Chancellor of the Exchequer whether he could communicate to the House the result of the inquiry which he promised to make of Lord St. Aldwyn as to the attitude of the Treasury Committee on new issues towards the London County Council new building scheme for schools. Mr. Acland, who replied, said that Lord St. Aldwyn had intimated that the Committee on Fresh Issues did not formally consider the application as they were informed that it had already been sanctioned by the Cabinet. Lord St. Aldwyn added that, if the case had been formally considered by the committee he felt sure they would have refused to sanction it.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are some of the more important prospected works of which particulars appear below:—Building: Burnham, Launceston, Stratford, houses and town planning: Chesterfield, Wigan, roads and tarring: the Kesteven, Wigan, sewerage and sewage disposal: Middlesbrough, water, gas and electricity: Battersea Clinton. Particulars of other prospected work will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Battersea B.C.—An intimation has been received of the intention of the Metropolitan Water Board to erect new premises and to make alterations to existing buildings at their works in Craigentinny.

Bodmin T.C.—A block plan of the proposed new cemetery at the Lizard, which was prepared by the borough surveyor, Mr. R. I. Bascombe, has been referred to the Sanitary Committee, who have been authorised to obtain tenders for carrying out the work.

Burnham U.D.C.—The county council have been notified by the urban district council of a proposal to provide a joint isolation hospital with the Highbridge Urban District Council.

Colne T.C.—Sir William Hartley has made an offer to provide a new hospital, consisting of twenty-four beds, on condition that the existing hospital is converted into a convalescent home as part of the proposed hospital.

Ealing T.C.—The foundation-stone was laid recently of a new branch public library in the Castle-road district. The plans have been prepared by Mr. Mervyn Macartney, and Messrs. Patman & Fotheringham, Islington, are the contractors.

East Sussex C.C.—It has been decided to make extension to the mental home at Hellingly asylum.

Falmouth T.C.—The borough surveyor, Mr. H. E. Tresidder, has been instructed to obtain tenders for internal decorations to the pavilion at Gyllyngdune, and to prepare estimates for painting the exterior.

Glasgow T.C.—It is proposed to provide a mortuary at Stonyetts, at an estimated cost of £615.

Hexham T.C.—The Local Government Board have asked the town council to submit for their consideration plans of the proposed new hospital.

Launceston T.C.—The council have appointed a committee to meet the rural district council in order to discuss a joint scheme for an isolation hospital.

Norwich T.C.—The Education Committee have decided to purchase property, at a cost of £400, for the extension of the Surrey-road school.

Portsmouth T.C.—A proposal is to be submitted to the next town council meeting for the erection of a tuberculosis hospital at Longstone.

Sleaford U.D.C.—It is proposed to erect an isolation hospital, at an estimated cost of £1,000.

Sunbury U.D.C.—It has been agreed to join with the Staines Rural District Council for the treatment in their small-pox hospital of patients from Sunbury.

Sunderland T.C.—The Electricity and Lighting Committee recommend that the foundation work for the two new motor generators to be installed at the Dunning-street electricity works be carried out by direct labour under the supervision of the general manager and engineer, at an estimated cost of £277, to be borne out of current revenue.

Swansea T.C.—The Local Government Board is to be asked to sanction a loan for the erection of an isolation hospital.

Teddington U.D.C.—The council are negotiating with the Staines Rural District Council with a view to providing a joint small-pox hospital.

Torrington T.C.—The Building Committee are considering plans for an extra ward at the hospital as an emergency ward.

HOUSING AND TOWN PLANNING.

Chesterfield T.C.—The assistant borough surveyor has prepared a scheme for the erection of thirty-eight houses for the working classes, at a cost not exceeding £185 each.

East and West Flegg R.D.C.—The Local Government Board have expressed approval generally of the housing schemes proposed by the council for Hemsby and Winterton, but suggest that it would be preferable to provide some houses of a smaller type, and that the schemes should be amended to provide, say, one pair of the council's type and two pairs on the lines given in the memorandum forwarded on August 6th. It is understood that the question of erecting a town must be deferred.

Lichfield T.C.—The consent of the Local Government Board is being sought to the appropriation of corporation land as a site for a housing scheme.

Margam U.D.C.—It has been decided to build a number of working-class houses in Marketstreet.

Newton Abbot U.D.C.—A committee has been appointed to consider the question of sites for a housing scheme.

Rainford U.D.C.—It was reported on Tuesday that eight of the fourteen cottages erected by the council were completed and ready for occupation. The council embarked on the scheme in September last, when, after Lord Derby had generously offered a most eligible site at a nominal cost, the sum of £2,500 was borrowed with the consent of the Local Government Board. The houses are in blocks of seven each, and contain three bedrooms, with a similar number of rooms below, and the usual domestic conveniences.

Truro R.D.C.—The Local Government Board wrote that they saw no reason why the council should not proceed with the preparation of housing schemes for Gerrans, Feock, Kea, St. Just, and St. Erme, and submit them to the board with a view to the schemes being carried out without delay when circumstances permitted. It was decided not to move in the matter until the war is over.

Wigan T.C.—The council recently adopted a modified scheme for the erection of working-class houses. It is proposed that twenty-eight of the houses fronting Melverley-street and Pottery-road should have little gardens at the front, and also be ornamented with stucco work. The estimated cost of ninety houses, and the laying out of the site and making the streets, is £18,395. The rents of thirty-seven houses will be 5s., and of fifty-three houses 6s. a week, making a yearly rental of £1,307 16s., while the annual expenditure was estimated at £1,617 8s. 7d. This appears to show a loss of £309 per annum; on the other hand, it is pointed out that the scheme would add £339 to the rateable value of the town, as well as yield a ground rent of £79, so that, instead of there being a loss, there would be an actual gain to the town.

REFUSE COLLECTION AND DISPOSAL.

Formby U.D.C.—The Health Committee have adopted a resolution suggesting that the householders should be circularised urging them to burn as much combustible refuse as they possibly could, instead of the authorities having to remove the material to be burnt at the tip.

Hove T.C.—The Sanitary Committee recommend the town council to ask for the sanction to a loan of £5,000 for the provision of crushing machines in connection with the disposal of refuse.

Ipswich T.C.—Messrs. Heenan & Froude and Messrs. Catchpole & Sons are the contractors for works in connection with the refuse destructor, the cost of which is estimated at £5,200.

ROADS AND MATERIALS.

Barrow R.D.C.—Owing chiefly to the opposition of the county council, it has been decided not to proceed with the Anstey Green Lane-road improvement until the end of the war.

Bollington U.D.C.—A scheme has been approved for the improvement of Wellington-road, at an estimated cost of £1,500.

Cornwall C.C.—An intimation has been received from the Road Board that the grants to Cornwall for improvement works during 1915-16 would be very considerably reduced, and consequently the programme has been revised and a schedule approved, the total cost of the revised schedule being £8,284.

Derby T.C.—The Highways Committee recommend

the acceptance of the tender of Messrs. Foden, of Sandbach, at £665, for the supply of a motor wagon.

Durham R.D.C.—The surveyor, Mr. G. Gregson, has been authorised to place with Fodens, Limited, an order for one motor tipping wagon to carry 5 tons, at a cost of £665, and the question of providing a second wagon has been deferred until next year. It was stated that the wagon would repay itself in a year and a-half.

Hammersmith B.C.—Consideration is being given to a scheme for the construction of a number of new roads to the west of Wood-lane, including a road about a mile in length, which it is proposed to form as a main arterial road.

Hove T.C.—In compliance with a request from the military authorities, the council have agreed to make up the portion of School-road between Portland-road and Marmion-road, at an estimated cost of £331. The section of Portland road is now being used as a hospital, and the council have the money in hand to make up the road.

Hursley R.D.C.—It was reported that the grant allowed by the Government for road repairs, owing to damage by military traffic, was £3,555, including £86, which was equal to 2½ per cent for the surveyor, Mr. A. H. Brain, for supervising the work. The sum of £1,853 had already been paid, and it was decided unanimously that a moiety of the percentage should be at once paid over to the surveyor.

Jarrow T.C.—Notices are to be served upon the owners for the making up of a number of roads.

Kesteven C.C.—The Road Board have sanctioned a grant of £1,400 for the purposes of [illegible]

Maldens and Coombe U.D.C.—Tenders of Messrs. Willis & Powis, at £1,474, and Messrs. John Wainwright & Co., Limited, at £150, have been accepted for work in connection with the improvements to South-lane.

Newton Abbot U.D.C.—The road from Penn Inn to Pinsent's brewery, Highweek-street, is to be tar-sprayed at a cost of £100.

Rochdale T.C.—The Cleansing Committee are considering the question of providing a motor sweeping machine.

Stanley U.D.C.—Tenders are to be obtained for cementing a number of footpaths.

Tilbury U.D.C.—Tar-spraying operations are to be carried out at an estimated cost of £240.

Warminster U.D.C.—A letter was received from Messrs. Field & Mackay stating that they were unable to supply road material at the tendered price owing to the increase in wages, &c., and suggesting that the price should be increased 6d. per ton. The council have decided to agree to this, subject to the contractors entering into a written contract to supply materials at the amended price for the ensuing year.

Wigan T.C.—Contracts have been accepted for granite setts for the repaving of parts of Wallgate, Prescott-street, Albert-street (Newtown), Birkett Bank, and School-lane, for which work the council have now received the sanction of the Local Government Board. All the work proposed some time ago has not been sanctioned, and the council have decided to fill up the holes in the surface, and so carry on until the Local Government Board allowed them to do the work properly.

SEWERAGE AND SEWAGE DISPOSAL.

Brandon U.D.C.—The tender of Messrs. T. Watson, at £199, has been accepted for the construction of a sewer at Station-avenue, Brandon Colliery.

Easingwold R.D.C.—The council are giving consideration to a report from Messrs. Fairbank & Sons, York, on the subject of the Stillington sewerage scheme. The report stated that the general effect of their suggestions would be to remove the sewage of the eastern part of the village, from the ditch in Mill-lane, in front of the Hall, and to discharge it, after proper tank treatment, into the Foss at a point where it would meet the full stream of the river. The total estimated cost of the scheme at the present market rates would be £281.

Llanfyllin R.D.C.—It has been agreed to proceed [illegible] £500.

Middlesbrough T.C.—Application [illegible] the Treasury for sanction to a loan of £8,000 for a sewerage scheme.

Nottingham T.C.—It is reported that the profit on Stoke Farm last year was £611.

Radcliffe U.D.C.—A sewerage scheme for Starling and Ainsworth is to be carried out, at an estimated cost of £2,000.

Ruislip-Northwood U.D.C.—A new sludge main is to be constructed at the sewage disposal works, at a cost of £85.

Stirling C.C.—It is proposed to instal a Fiddian distributor at the Bonnybridge sewage disposal works, and to reconstruct the filter-beds, at an estimated cost of £700. It has likewise been agreed to construct sludge ponds at the Longcroft works, at an estimated cost of £128.

Tavistock R.D.C.—The suitability of a proposed [illegible] at Whitchurch has been referred to the parish council for consideration.

Uxbridge R.D.C.—The tender of Mr. Hanson, at £751, has been accepted for the Harefield drainage scheme.

WATER, GAS, AND ELECTRICITY.

Aberdeen T.C.—A proposition not to proceed with the Provisional Order in connection with the £75 water supply was defeated recently in the town council by 23 votes to 4.

Ashbourne U.D.C.—The council are seeking to make provision for an extension of the water supply.

Barnsley T.C.—The council have adopted a scheme for the extension of the electricity works, at an estimated cost of £21,850.

Battersea T.C.—The proposal to extend a supply of electricity to the Nine Elms district, at an estimated cost of £15,750, is not opposed by the Treasury.

Bingley U.D.C.—The financial statement of the gas department for the year ending March 31st last shows a nett profit of £598. The chairman of the Gas Committee (Mr. Whitwam) said that in consequence of the way in which they had secured their coal supplies, it would not be necessary to increase the price of gas, now 1s. 10d. per 1,000 cub. ft., but he could not promise to avoid increasing the price another year.

Blackrock U.D.C.—The electric lighting scheme has received the sanction of the Local Government Board, and application is to be made to the Treasury for authority to borrow the money for the works.

Bridgend U.D.C.—The Local Government Board is to be asked to sanction the purchase of two engines for the electricity works, at an estimated cost of £2,000.

Bristol T.C.—The Electricity Committee recommend the purchase of a 6,000-kw. turbo-alternator at the Avonbank works, at an estimated cost of £26,949.

Calne R.D.C.—Consideration is to be given to the improvement of the water supply at Foxham.

Clutton R.D.C.—A communication has been received from the Local Government Board stating, with reference to the proposals of the council for a scheme of water supply for the parishes of Chelwood, Chew Magna, Chew Stoke, Norton Malreward, Publow and Stanton Drew, at an estimated cost of over £10,000, that the board would consider an application for their sanction, but that at the present moment they could not promise to authorise a loan.

East Lothian C.C.—The council have authorised the Finance Committee to raise a loan of £300 for the Innerwick water supply.

East Riding C.C.—The question of a water supply for Patrington was before the council lately. The Public Health and Housing Committee had resolved [illegible] Council failing to make arrangements with the Hull Corporation for a supply of water to their area within a reasonable time, the clerk be instructed to obtain and submit to the committee information as to the villages in the Patrington Rural District for which a water supply is needed, and as to the cost of providing a supply from the mains to be laid by the Hull Corporation. The county council adopted the proposal of the committee.

Edinburgh T.C.—The Electric Lighting Committee recommend the council to accept an estimate by the Stirling Boiler Company, Limited, Renfrew, amounting to £32,000, for tube boilers for the new electrical station at Portobello. It is understood that the

[illegible] is less than was expected in view of [illegible]

Kilrush U.D.C.—The council are inviting applications from engineers [illegible] to supply them with plans for a [illegible] (within the urban area) for the town of Kilrush.

Lewisham B.C.—The General Purposes Committee [illegible] objections urged by the borough council to the Metropolitan Water Board Bill before the Commons. With reference to the breaking up of streets the committee added the following words to the Bill: "Nothing in this Act with regard to the breaking up of streets shall affect the rights of the Metropolitan borough council under the Metropolis Management Acts [illegible] of any road and to recover the cost of so doing from the board." The committee also granted an amendment to clause 46 (in the original Bill) with reference to the cutting-off of water, and they struck out clause 47 which would have empowered the Water Board to recover expenses incurred preliminary to cutting off supply in certain cases.

Margam U.D.C.—A loan of £5,000 is to be taken up for the purpose of [illegible]

Market Harborough R.D.C.—A letter has been received from the Local Government Board stating that as the board have [illegible] sec. 299 of the Public Health Act, that the council is in default in supplying the village of Fleckney with water, the board have directed an inquiry into the [illegible]

Okehampton T.C. [illegible] by steel tubes, providing a sluice valve hydrant in [illegible] receive a meter.

Rotherham T.C.—The nett surplus of the electricity undertaking, subject to the requirements for the renewal fund, [illegible] Practically half of this decrease of £2,572 was the result of the reduced price of current to the tramways department, and the balance of the decrease was principally due to the increased price of coal and heavier repairs to plant. With regard to the gas undertaking, the provision made in the estimates last year to meet the anticipated deficiency has proved to be adequate, and there is a credit balance of £50 to be carried forward.

St. Pancras B.C.—One-third of the street lamps only are now lit, and these are extinguished by 10 p.m. As during the lighter evenings there would be scarcely any interval between the completion of the lighting and the commencement of the extinguishing of the lamps, the council have agreed that, for the next three months, the gas lamps in the borough be not lighted.

Skegness U.D.C.—New water mains are to be laid at an estimated cost of £1,000.

Strabane U.D.C.—Tenders are to be obtained for a new sulphate of ammonia plant for the gasworks.

Swanage U.D.C.—With respect to the proposed water supply scheme for Studland, it was announced at the recent council meeting that the War Office are prepared to take over the whole of the council's scheme, make the bore, and simultaneously lay the main, and provide the necessary plant, the council to pay easements and compensation to the tenant. In the event of a success, the council are to take over all the plant not of a temporary character, and pay the War Office what the cost was to them, the test to be a continuous supply of not less than 8,000 gallons per hour per day of twenty-four hours, in September. The council are only to be compelled to buy in the event of the test proving satisfactory to the council's engineer, Mr. W. H. Pearce; but in the event of a failure they will have to pay the War Office the sum of £650, the estimated cost of the experimental bore the council contemplated making.

Wigan T.C. The chairman of the Electric Light Committee recently called attention to the finances of the electricity undertaking. In 1913-14 their excess of payments was £1,609, and for 1914-15 it was £995 [illegible] notwithstanding that they had had to pay during 1914-15 a sum of £1,100 more for coal than in the previous year; so that, adding the two sums together, the station was £1,714 better off.

Willesden U.D.C.—It was announced that the clerk and Mr. Blake, the electrical engineer, waited upon the Local Government Board with reference to extending the electricity undertaking so as to supply current to factories engaged in manufacturing the munitions of war in West Willesden, and the board had sanctioned the work being carried out.

Wombwell U.D.C.—The Local Government Board [illegible] ply limits to Great Houghton and Little Houghton.

MISCELLANEOUS.

Fareham R.D.C.—The council have accepted the tender of Mr. Charles Bennett, at £112, for the supply of a "Morgan" tri-car for the use of the sanitary surveyor.

Kingston (Surrey) T.C.—The tender of the Anglo-American Oil Company has been accepted for about 1,400 tons of fuel oil for the Diesel engines for a period of two years. The price is 65s. per ton, delivered at Purfleet.

Plymouth T.C.—In pursuance of the minute passed at the last council meeting, an agreement had been entered into with the Devonport and District Tramways Company for the sale by the company to the corporation of the company's undertaking on Tramway Act terms.

BITUMINISED EARTH PAVING.

An American [illegible] use for about three years at Iola, Kansas. The earth obtained along the road or street, or from any convenient place, is delivered to a portable plant on the ground. In this it is first heated, pulverised and screened. The dust is then raised to a mixing hopper where hot asphalt is admitted in the form of a fine spray, so that the dry dust will absorb it. The quantity and character of the asphalt vary with the character of the earth used.

The mixture is dumped from the hopper into wagons, and distributed upon the roadway, where it is spread to a thickness of about 1½ in. When cool it is rolled with a 5-ton roller. The process is repeated until a depth of about 3 in. has been obtained.

Practically any kind of material that will absorb asphalt can be used. Hard and non-absorbent materials are not suitable, and a sandy loam having a large proportion of coarse, flinty sand would be less suitable than a loam without sand. It is stated that with the absence of hard material or aggregate no expansion joints are necessary, and there is no tendency to crack or disintegrate. The wearing surface is waterproof, but care must be taken to keep the sub-grade well drained.

The first paving at Iola was on a single block in October, 1911. Since then twenty-six blocks of pavement have been laid, the foundation in all cases being the natural soil, well rolled and compacted. Mr. C. E. Stebbins, Commissioner of Streets, has reported favourably on this paving. The cost is said to be from $1·10 to $1·25 per square yard of 3-in. paving.

Women as Scavengers.—Six women have begun work as scavengers at Gateshead, Durham.

Refuse Removal.—In the House of Commons on Wednesday, Mr. Herbert Samuel, President of the Local Government Board, announced that he was about to issue a circular to all urban authorities in England and Wales urging them to do all in their power to [illegible] neighbourhood of dwellings.

Care of Drawing Boards.—A correspondent of an [illegible] of drawing board: Give it a thorough coat of very thin shellac before it has a chance to become warped in the slightest. Use only the very best grade of white shellac, and make it as thin as possible with alcohol, and in brushing it over the surface rub it thoroughly into the pores of the wood, thus making the board thoroughly waterproof. The shellac application should be used over the entire surface. After the board has been used for [illegible] holes, it is a good idea to give it another coat. Do not, however, allow a glossy surface to remain on the board, as it destroys the desired drawing surface; if a glossy surface remains, rub well with plain alcohol. Several such treatments during the life of a drawing board tend to hold it in its original form by keeping moisture from permeating it.

PERSONAL.

Mr. G. A. Waite has been appointed temporary assistant to the city surveyor of Salisbury.

Mr. C. F. Farrington has been appointed engineer to the Conway and Colwyn Bay Water Supply Board, in succession to his father, deceased.

Mr. E. B. B. Newton, M.INST.C.E., F.S.I., borough surveyor of Paddington, has been gazetted to a Second Lieutenancy in the Royal Engineers (T.).

Mr. Felix O'Doherty, assistant county surveyor for North Leitrim, has joined the Royal Engineers. It is understood that his position will be kept open for him.

Mr. W. H. Pearce, surveyor to the Swansea Urban District Council, and the chairman of the Works Committee have been deputed to attend the Road Conference to be held at Westminster in June.

Messrs. E. A. Green, chief building surveyor, Sheffield, and E. J. Hamlin, B.SC., municipal engineer, Stellenbosch, Cape Colony, have been elected members of the Royal Sanitary Institute.

Dr. E. H. Nash, the medical officer of Wimbledon, has volunteered for service with the Royal Army Medical Corps, and has received permission from the town council to go "if his services are urgently required"—as undoubtedly they are already.

Mr. George Horne, sanitary inspector, Paisley, has been appointed sanitary inspector of the county of Sutherland. He was sanitary inspector for two years at Port Glasgow, and six years at Paisley, and he has also acted as clerk of works in various parts of the country. He is a native of Dunbar.

Mr. F. W. Hunt, chief assistant in the valuer's department of the London County Council, was on Tuesday last appointed to the position of valuer, at a salary of £1,500 a year, rising to £1,800 by instalments of £100 every two years. There were twenty applications for the appointment. Mr. Hunt, who passed first in the initial open competitive examination held by the London County Council, was appointed in 1890 to the estates and valuation department constituted under Mr. Andrew Young, under whose direction he learned his profession. He has had practical experience in all its branches, especially rating and assessments, and has been particularly identified with the council's Parliamentary work. In the course of the discharge of his duties he has had first-hand experience of values in every part of the County of London, in some districts in nearly every street. Mr. Hunt is a Fellow of the Surveyors' Institution, a Fellow of the Auctioneers' and Estate Agents' Institute of the United Kingdom, and he has read papers before the Surveyors' Institution.

Permission has been given by the Maldens and Coombe Urban District Council to Mr. Bishop, clerk to the surveyor (Mr. R. H. Jeffes), to join the Army, and it has been agreed to keep his berth open for him, but no action was taken as to augmenting his army pay.

Before the commencement of business at the last meeting of Woolwich Borough Council, the mayor, Alderman H. S. Syer, J.P., referred to the death—reported in our last issue—of Mr. J. Rush Dixon, the borough engineer, and Councillor Dawson proposed that a letter of sympathy and condolence be sent to the widow and family, referring to the admirable manner in which Mr. Dixon had carried out his duties, the esteem in which he had been held, and the sympathy felt with the widow and family. The town clerk expressed the appreciation which the staff had felt for Mr. Dixon, and their grief at his death. He also read a letter from Mr. Baines, the superintendent architect of H.M. Office of Works, expressing great personal appreciation of and indebtedness to Mr. Dixon for the kindness and interest he displayed in the Well Hall housing scheme. He felt his loss as a personal grief. The motion was agreed to by the council standing in silence. Among those who attended the funeral, which, as we have already stated, took place at Plumstead cemetery, were Mr. T. Mundy, the deputy borough engineer; Mr. E. B. B. Newton, borough engineer of Paddington; Mr. J. Sutcliffe, borough engineer of Deptford; Mr. E. Van Putten, borough engineer of Lewisham; Mr. H. C. J. Edwards, borough engineer of Lambeth; Mr. H. E. Anderson, chief assistant, Lambeth borough engineer's office; Mr. R. J. Angel, borough engineer of Bermondsey; Mr. E. Finch, deputy engineer to the Corporation of London; Mr. H. Heckford, borough engineer of Poplar; Mr. T. Cole, general hon. and consultant secretary to the Institution of Municipal and County Engineers; and Messrs. Cooper (Val de Travers, Limited), and F. W. Laws (Patent Victoria Stone Company).

Something Like Gratitude.—The employees of the Llanrwst Rural District Council having been granted a half-holiday on Saturday, the concession was acknowledged in an eloquent letter from the men, from which a simple sentence may be quoted: "The hand of progress and the elevation of mankind were discernible in the council's action, and although it may seem to some but a light matter, the council will have occasion to rejoice to all eternity for the noble part they had taken in the uplifting of the ideals of man's duty to his brother in the flesh. Ever since the result of the discussion had been made known to us, we have with one heart and spirit sang a song of gratitude and appreciation."

FOR OTHER ADVERTISEMENTS
See End of Paper.

CORPORATION OF MADRAS.

SPECIAL WORKS DEPARTMENT.

CONTRACT M & M. No. 22 A

The Corporation of Madras is prepared to receive Tenders from competent persons willing to enter into a Contract for the Supply and Delivery of Cast-iron Pipes, Special Castings, Sluice Valves, Hydrants, &c. The total weight of the pipes and special castings is about £4,700 tons, the diameters varying from 2½ in. to 42 in.

Forms of Tender, prepared by J. W. Madeley, Esq., M.A., M.INST.C.E., M.AM.SOC.C.E., &c., Special Engineer, Corporation of Madras, may be obtained from the undersigned on payment of 10s. each, which will not be returned.

Tenders, accompanied by a deposit in currency notes, or a draft on a Madras Bank of Rs.500, should be sent direct to the President, Corporation of Madras, so as to reach him at or before 12 noon on the 14th day of July, 1915.

The Corporation does not bind itself to accept the lowest or any Tender.

JAMES MANSERGH & SONS,
Agents to the Corporation of Madras.

5 Victoria-street,
Westminster.
May 12, 1915. (2,571)

PARISH OF LAMBETH.
BOARD OF GUARDIANS.

The Guardians of the Poor of the Parish of Lambeth hereby invite Tenders for the execution of work in connection with the Painting and Cleaning of their Infirmary and Offices at Brook-street, Kennington, S.E.

Printed Form of Tender, with Conditions annexed, together with Specifications (which alone will be received), may be obtained at this Office on any day (except Saturday) between the hours of ten and five upon payment of £2 in respect thereof, which will be returned to each person sending in a *bonâ-fide* Tender.

The Tenders, which must be sealed and superscribed "Tender for Painting at the Infirmary, &c.," must be sent to the undersigned or placed in the box provided for their reception in the Office of the Clerk to the Guardians, by the tenderers or their representatives, should they so desire, on or before Tuesday, the 8th proximo, and will be opened in the Board Room at 11 a.m. on the following day, when all persons tendering, or their authorised agents, should be in attendance.

The Guardians do not pledge themselves to accept the lowest or any Tender.

(By order)

JAMES L. GOLDSPINK,
Clerk to the Guardians.

Guardians' Board Room and Offices,
Brook-street, Kennington-road, S.E.
May 19, 1915. (2,572)

CUDWORTH URBAN DISTRICT COUNCIL.

The above Council invite Tenders for the construction of Sewage Disposal Works, including Screen Chamber, Detritus Tanks, Liquefying Tanks, Storm Tanks, Percolating Filters, Sludge Beds, Humus Tanks, &c.

Plans, Specifications and General Conditions may be seen, and Bill of Quantities and further particulars obtained, from W. T. Lynam, Engineer and Surveyor, Council Offices, Cudworth, upon the payment of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders to be sent to the undersigned on or before Monday, June 7, 1915.

The Council do not bind themselves to accept the lowest or any Tender.

W. T. LYNAM,
Engineer and Surveyor.

Council Offices,
Cudworth. (2,580)

EAST SUSSEX COUNTY COUNCIL.
TO STEAM ROLLER PROPRIETORS.

Tenders are invited for the Hiring of Steam Rollers and Scarifiers for use upon the main roads during the period ending March 31, 1916.

Particulars and Form of Tender can be obtained on application to the undersigned.

Tenders, endorsed "Tenders for Steam Rolling," to be addressed and delivered to the undersigned on or before Monday, the 14th June, 1915.

The lowest or any Tender will not necessarily be accepted.

FRED I. WOOD, A.M.I.C.E.,
County Surveyor.

County Hall, Lewes.
May, 1915. (2,581)

PAIGNTON URBAN DISTRICT COUNCIL.
WORKING FOREMAN WATERWORKS.

Applications are invited for the vacancy of Working Foreman for the Waterworks belonging to this Council.

Applicants must have had at least five years' experience in similar work, be good jointers by cast iron mains, accustomed to repairing and overhauling meters, and to the control of men.

Wages 30s. per week, rising by 2s. 6d. per week at the end of the first and subsequent years to a maximum of 40s. per week.

Applications, in candidate's own handwriting, stating age, previous experience, together with copies (only) of not more than three recent testimonials as to experience, capabilities and personal character, to be sent to the undersigned not later than Tuesday, June 8th.

JAMES A. HUTCHINSON,
Assoc.M.Inst.C.E., &c.,
Waterworks Engineer and Manager.

Town Hall, Paignton.
May 18, 1915. 2,575

URBAN DISTRICT OF FINCHLEY.
TEMPORARY ENGINEERING ASSISTANTS.

The Council of the above-named District require the services of Two Temporary Engineering Assistants in the Engineer's and Surveyor's Department, at a salary of £120 per annum each.

Candidates must be competent Levellers and Surveyors, and good Draughtsmen, and must have had twelve months' experience in a municipal engineer's office.

Form of application may be obtained from the Engineer and Surveyor at the undermentioned address.

Applications, addressed "Temporary Assistant," accompanied by three recent testimonials, must be delivered to the undersigned by not later than 12 o'clock noon on Monday, the 7th of June, 1915.

Canvassing, either directly or indirectly, will be deemed a disqualification.

E. H. LISTER,
Clerk of the Council.

Council Offices,
Church End,
Finchley, N.
May 20, 1915. (2,574)

DISEASE TRANSMISSION BY FLIES.

WARNINGS TO LOCAL AUTHORITIES.

In the House of Commons Mr. Boland asked the President of the Local Government Board what steps, if any, had been taken to inform the public as to the danger to health involved in the transmission of disease by flies under existing war conditions; whether any leaflets on the subject had been published, and, if not, whether a leaflet published by the Zoological Society of London would be utilised, and whether steps would be taken to set up a small Committee to deal with the subject.

Mr. Herbert Samuel said the board had issued seven reports on "Flies as Carriers of Infection," and they had, during the last few years, warned local authorities by circular, at the beginning of the summer, of the dangers of allowing accumulations of refuse, which might form breeding-grounds for flies, to remain in the neighbourhood of dwellings. They had for some time past been urging individual local authorities who were not dealing satisfactorily with the refuse of their districts to improve their methods. In a circular letter which was about to be issued attention would again be drawn to the matter. The War Office and his department were co-operating in this, as in other matters affecting the health of the troops and of the civil population. A number of local authorities had issued posters and leaflets on this subject. He was considering the preparation and issue by the Local Government Board of a series of model leaflets on this and other health subjects, which local authorities could use if they so desired. He really thought it necessary to appoint a committee.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

NORTHWICH MEETING.

A North-Western District meeting is to be held at the Council Offices, Northwich, on Friday, May 28th.

PROGRAMME.

11 a.m.—District executive meeting.
11.30 a.m.—District meeting.
Reception in the council chamber by the chairman of the council, Mr. Councillor Worsley, J.P.
District business.
Paper by Mr. J. Brooke, engineer and surveyor, on "Municipal Works of Northwich," which will be taken as read.
Discussion.
12.45 p.m.—Visit to baths.
1 p.m.—Lunch at Lion and Railway Hotel (tickets 3s. each).
2 p.m.—Leave Lion Hotel.
2.15 p.m.—Arrive Marston salt rock mine.
3 p.m.—Leave Marston salt rock mine.
3.20 p.m.—Arrive Anderton Lift.
4 p.m.—Leave Anderton lift.
4.15 p.m.—Arrive swing bridge.
4.30 p.m.—Leave swing bridge.
4.35 p.m.—Arrive sewage pumping station.
4.50 p.m.—Leave sewage pumping station.
5.20 p.m.—Arrive Cote Brook waterworks.
6 p.m.—Leave Cote Brook waterworks.
6.15 p.m.—Arrive Blue Cap Hotel (tickets for tea 2s. each).
7.20 p.m.—Leave Blue Cap Hotel.

Tickets for motor char-à-banc 2s. 6d. each.

It is necessary that the nationality of persons attending this meeting should be declared.

A. W. BRADLEY, M.INST.C.E.,
Hon. District Secretary.

St. Helens.

SOUTHALL MEETING.

A meeting of the Eastern District will be held at the Town Hall, Southall, on Saturday, June 5th.

PROGRAMME.

2 p.m. Meet at Town Hall, Southall.
Business.
Read minutes of previous meeting.
2.30 p.m. Proceed by motor omnibus (fare 1s. 6d. each)—
(*a*) To visit open-air bath:
(*b*) Through Osterly Park to inspect sewage disposal works.
4.30 p.m.—Return to town hall to tea, kindly provided

by the engineer and surveyor, Mr. Reginald Brown, M.INST.C.E.

5.15 p.m.—Discussion of works inspected, and papers by Mr. Reginald Brown (member), "Fourteen Years' Municipal Work in a London Suburb," and Mr. J. H. Edmondson, F.C.S., "Fitting up and Working of a Sewage Works Laboratory."

Conveyances for the various visits have been arranged, tickets 1s. 6d. each.

J. A. WEBB,
Hon. District Secretary.

Great Stanmore.

AYR MEETING.

The annual Scottish District meeting of the institution will be held at Ayr on Friday and Saturday, June 4th and 5th next.

PROGRAMME.

Friday, June 4th.

11 a.m.—Business meeting in County Hall, County Buildings, Ayr.

11.30 a.m.—Discussion on the following papers:—
"Suggested Town Planning Details for Scottish Conditions," by John Bryce, M.INST.C.E., Office of Public Works, Glasgow, with criticisms by some members of the Town Planning Committee of the Scottish District.
"Pressure Scraping 15 miles of Water Mains," by James McFadzean, B.SC., ASSOC.M. INST.C.E., assistant burgh engineer, Ayr.

1 p.m.—Reception by the Ayr County Road Board and the provost and magistrates of Ayr in the County Hall.

1.15 p.m.—Luncheon in the Lesser County Hall, County Buildings, kindly provided by the County Council of Ayr.

2.30 p.m.—Discussion on the following papers:—
"Road Work," by R. Drummond, C.E., county road surveyor, Renfrewshire County Council, Upper District.
"Description of Experimental Stretches of Road Laid in the Ayr District, Ayr County, and Meteorological Station in Connection Therewith," by Allan Stevenson, C.E., county road surveyor, Ayr County Council, Ayr District.
"Municipal Housing," by Wm. A. Macartney, ASSOC. M. INST. C.E., burgh engineer, Johnstone.

4.15 p.m.—MUNICIPAL WORKS, &C., TO BE VISITED.
(1) Visit to refuse destructor, electricity station, hospital extension, pavilion and esplanade, tar-macadam roads, &c.
Carriages (kindly provided by the Corporation of Ayr) will leave the County Hall at 4.15 p.m.
(2) Visit to Burns Monument and cottage, by kind invitation of the Corporation of Ayr.
Tramway cars will leave town hall at 4.15 p.m., arriving back at 6.30 p.m.
Tea will be served in the tea gardens at 5 p.m.
NOTE.—The time allotted will only permit of members visiting one of the above.

7.30 p.m.—Annual Dinner in Station Hotel. Tickets, 7s. 6d. each.

Saturday, June 5th.

VISIT TO EXPERIMENTAL STRETCHES OF ROAD AND METEOROLOGICAL STATIONS IN THE AYR DISTRICT, AYR COUNTY, HILLHOUSE QUARRY AND TROON.

9.45 a.m.—Motor chars-à-banc will leave Station Hotel at 9.45 a.m. prompt, and proceed to the experimental stretches of road, Hillhouse Quarry, and Troon.

1 p.m.—Luncheon (kindly provided by the Hillhouse Quarry Company) will be served in the South Beach Hotel, Troon, at 1 o'clock, after which the return journey will be made to Ayr, arriving at 2.30 p.m.
Tickets for motor chars-à-banc, 3s. 6d. each.

CIRCULAR TOUR BY MOTOR CHAR-À-BANC TO LOCH DOON, VIA PATNA AND DALMELLINGTON, FOR NESS GLEN.

2.30 p.m.—Motor char-à-banc will leave Station Hotel at 2.30 p.m., arriving back at 6.40 p.m.

5 p.m.—Tea will be served at Dalmellington at 5 p.m. Ticket for motor char-à-banc and tea, 8s. each.

6.50 p.m. Trains leave Ayr Station for Glasgow at 6.50 p.m.

Mr. Young, burgh engineer, Ayr, has kindly offered to arrange for ladies present being well looked after during the meetings on Friday forenoon and afternoon; and also on Saturday forenoon.

DAVID A. DONALD,
Hon. District Secretary.

Grangemouth.

MATLOCK MEETING.

The arrangements for the institution meeting to be held at Matlock on June 12th include visits to the new sewage works, the brine and electric baths, and other undertakings.

J. W. DUDLEY ROBINSON,
Secretary.

INSTITUTION OF MUNICIPAL ENGINEERS.

EASTERN, NORTH-EASTERN AND SOUTH-EASTERN DISTRICTS.

A meeting of these districts will be held at Dunstable on Saturday, May 29th.

PROGRAMME.

1.30 p.m.—Reception at the town hall by his Worship the Mayor of Dunstable, Mr. F. T. Garrett, J.P.

2 p.m.—Leave town hall by conveyance. (Approximate cost of conveyance, 1s. 6d. per head.)

2.15 p.m.—Arrive at sewage disposal works.

3 p.m.—Leave sewage disposal works.

3.10 p.m.—Arrive at gasworks.

3.30 p.m.—Leave gasworks, and proceed on foot to Maiden Bower (old British camp), onward by Green Way (old British road) to Totternhoe Knolls (old British and Roman camps). Inspect cottages erected by the Luton Rural District Council at Totternhoe.

4.30 p.m.—Proceed by conveyance to waterworks, &c.

5.20 p.m.—Tea at Dunstable, by kind invitation of the Mayoress.

Descriptive notes on the various undertakings and inspections will be given by Mr. W. F. Wilkins, borough surveyor, Dunstable, and Mr. H. Pickering, surveyor, Luton Rural District Council.

Trains leave Luton (G.N.R., adjoining M.R. Station) for Dunstable at 12.20, 1.5 and 1.30, and Leighton Buzzard (L. & N.W.R.) for Dunstable at 12.25.

Trains leave Dunstable for Luton at 6.15 and 7.25, and for Leighton Buzzard at 6.5 and 8.13.

G. BELSON CHILVERS,
Hon. District Secretary.

COUNCIL MEETING.

The next meeting of the council will be held in London on Wednesday, May 26th, at 5.30.

B. WYAND,
39 Victoria-street, *Secretary.*

Municipal Employees and War Service.—A committee of Great Yarmouth Town Council, following a scrutiny of the list of men in the corporation employment, have instructed the borough engineer, Mr. J. W. Cockrill, to intimate to twenty-eight men eligible for enlistment or employment in armament work that the time had arrived for them to answer their country's call. Their wages would be made up and their places kept open. Forty-six out of 120 men on the staff of the tramway manager have already joined the forces, and thirteen other men are to be called upon to offer their services. Twenty out of sixty-four men on the staff of the borough electrical engineer have gone, and the chief of the department does not think he has left more than one man whom he could ask to serve. The borough engineer is to reinstate for the period of the war any workmen over seventy years of age recently placed on the retired list who are capable of doing efficient work.—Replying to a question in the House of Commons last week, Mr. Herbert Samuel said he had no information of the improper refusal of local authorities to allow their employees to join the Army, but if any such cases were brought to his notice he would make inquiry into the matter. Answering a further question, Mr. Samuel said he feared it was impossible to make an estimate of any value of the number of men of military age—excluding those engaged in work essential to public health—who were still employed by county and municipal authorities in the British Isles.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

WIMBLEDON MEETING.

On Saturday, May 29th, a visit will be paid to the Wimbledon sewage works and the S.O.S. works, Durnsford-road, Wimbledon, near Wimbledon Park Station (District Railway).

Members are invited to meet at 3 p.m. at pumping station, Durnsford-road, to view the pumping plant, lime mixing plant, filters and sludge pressing plant, the [illegible] by the Hydro-Aero-Extractor Co., Ltd., and the recovery of fats resulting from such treatment. Afterwards an inspection will be made of the S.O.S. works, and the products resulting from the destructive distillation of sewage sludge.

ROYAL SANITARY INSTITUTE.

SHREWSBURY MEETING.

Mr. H. Percy Boulnois, M.Inst.C.E., will occupy the chair at a meeting of the Royal Sanitary Institute, which is to be held at the Guildhall, Shrewsbury, on Friday, May 28th, when lectures will be delivered on Modern Methods of Refuse Disposal, the Purification of Water, and [illegible] by Dr. D. Thomas Orr.

The proceedings will commence at 7.0 p.m.

On the following morning an inspection will be made of the Shrewsbury housing scheme, Ditherington, [illegible] and the corporation abattoir. The members will be entertained to luncheon [illegible] by the mayor.

BRISTOL MEETING.

On June 11th, at Bristol Guildhall, a conference on "Co-ordination of Military and Civil Sanitary Services in War-time," will be opened by Dr. D. S. Davies, medical officer of health, and Mr. L. S. McKenzie, [illegible] city engineer.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1056) subject to later confirmation by letter.*

ROAD FOREMAN.—May 24th.—Northwich Rural District Council. 32s. per week. Mr. J. [illegible], clerk.

FOREMAN.—May 28th.—Cannock Urban District Council. 35s. per week.—Mr. Robert Blanchard, engineer and surveyor.

BOROUGH SURVEYOR'S GENERAL ASSISTANT.—May 29th.—Corporation of Burton-upon-Trent. £100 a year.—Borough Surveyor.

CHIEF INSPECTOR OF NUISANCES.—May 29th.—Corporation of Plymouth. £170—£230.—Mr. O. Hall, medical officer of health, Town Hall.

SURVEYOR.—May 31st.—Llanfrechfa Urban District Council. £146 per annum.—Mr. William Clark, clerk, 44 Coronation-road, Cwmbran, near Newport, Mon.

SURVEYOR'S ASSISTANT.—May 31st.—Corporation of Beverley. £65 per annum. Mr. J. Gould Smith, borough surveyor, 31 Lairgate, Beverley.

ENGINEMAN.—June 1st.—Weybridge and Oatlands Joint Sewerage Committee. 35s. per week, with cottage, light and coal.—Mr. John S. Crawshaw, surveyor, Council Offices, Weybridge.

SURVEYOR AND INSPECTOR.—June 1st.—Seaham Harbour Urban District Council. £200 per annum.—Mr. J. W. Richardson, clerk.

SURVEYOR AND WATER ENGINEER.—June 8th.—Bridgwater Rural District Council. £250—£325.—Mr. T. M. Read, clerk, Rural District Council Offices, Bridgwater.

INSPECTOR OF NUISANCES.—June 14th.—Colwyn Bay Urban District Council. £150 per annum.—Mr. J. Amphlett, clerk.

DISTRICT SURVEYORS (2).—June 18th.—London County Council.—The Clerk, County Hall, Spring-gardens, S.W.

TEMPORARY CLERK.—Corporation of Cheltenham.—Borough Engineer, Municipal Offices, Cheltenham

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

CHORLEY.—May 25th.—For alterations to the discharge block and painting, for the Chorley Joint Hospital Board.—Mr. R. E. Stanton, clerk.

UXBRIDGE.—May 25th.—For the erection of a lavatory, for the urban district council.—Mr. W. L. Eves, surveyor, 54 High-street, Uxbridge.

KENT.—May 26th.—For the execution of repairs to schools, for the Education Committee.—Mr. W. H. Robinson, architect, Sessions House, Maidstone.

ISLE OF WIGHT.—May 26th.—For repairs and other work to a bridge, for the rural district council. Mr. L. A. Cozens, surveyor, Walmer Villa, Castle-road, Newport, I.W.

LEYTON.—May 27th.—For the erection of a temporary fire station, for the urban district council.—Mr. E. H. Essex, surveyor, Town Hall, Leyton, Essex.

SHEFFIELD.—May 28th.—For excavations and concrete work, for the Electric Supply Committee.—Mr. S. E. Fedden, engineer and general manager, Commercial-street, Sheffield.

CANNOCK.—May 28th.—For the construction of conveniences, for the urban district council.—Mr. R. Blanchard, engineer.

DEVON.—May 29th.—For alterations to certain schools, for the Education Committee.—The Architect, 1 Blackall-road, Exeter.

HASTINGS.—May 31st.—For the erection of band-stand and covered shelters, for the corporation.—Mr. P. H. Palmer, borough engineer.

DEWSBURY.—May 31st.—For the erection of buildings in connection with the Whitley Sanatorium, for the corporation.—Borough Surveyor, Town Hall.

STAMFORD.—June 4th.—For the erection of twenty-four houses, for the corporation.—Mr. F. R. Ryman, borough engineer, Town Hall.

DUNDEE.—June 4th.—For making reinforced-concrete floors and jointless flooring at generating station, for the corporation.—Mr. H. Richardson, general manager and engineer, Electricity Department, Dundee.

GRIMSBY.—June 5th.—For alterations to "Rutland House," for the rural district council.—Mr. J. F. Wintringham, St. Mary's Chambers, Grimsby.

SOMERSET.—June 5th.—For carrying out sea defence works at Blue Anchor, near Minehead, for the county council.—Mr. Edward Stead, county surveyor, Wells.

GREENOCK.—June 15th.—For the erection of 150 houses, for the corporation.—Office of Public Works, Municipal Buildings.

Iron and Steel.

WIGAN.—May 26th.—For the supply of electricity cable, transformer and switchgear, for the corporation.—Mr. J. Slevin, borough electrical engineer, Bradford-place, Wigan.

PORTSMOUTH.—June 1st.—For the supply of tram rails, fishplates and iron tiebars, for the Tramways Committee.—Mr. V. G. Lironi, engineer, Fratton-grove, Portsmouth.

MANCHESTER.—June 2nd.—For the supply and erection of coal-unloading crane, and conveying plants, for the Electricity Committee.—Mr. F. E. Hughes, secretary, Electricity Department, Town Hall.

MADRAS.—July 14th.—For the supply of cast-iron pipes, special castings, sluice valves and hydrants, for the corporation.—Mr. J. W. Madeley, special engineer; agents, Messrs. James Mansergh & Sons, 5 Victoria-street, Westminster, London, S.W.

RANGOON.—August 11th.—For the installation of a system of fire alarms, for the municipality.—Messrs. Ogilvy, Gillanders & Co., 67 Cornhill, London, E.C.

Roads.

PONTYPRIDD.—May 24th.—For carrying out road improvements at Llantwit-road, for the urban district council.—Mr. W. E. Lowe, engineer and surveyor.

PONTYPRIDD.—May 24th.—For the execution of road improvements, for the urban district council.—Mr. W. E. Lowe, engineer and surveyor.

ILFORD.—May 24th.—For making up certain roads, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

EASTBOURNE.—May 24th.—For private improvement works, for the corporation.—Mr. A. E. Prescott, borough surveyor.

GATESHEAD.—May 25th.—For paving a street, for the corporation.—Mr. N. P. Pattinson, borough engineer.

ASHTON-UPON-MERSEY.—May 25th.—For laying granite tarred macadam, for the urban district council.—Mr. F. Hutton, surveyor.

GATESHEAD.—May 25th.—For paving a street, for the corporation.—Mr. N. P. Pattinson, borough engineer.

BOGNOR.—May 26th.—For the supply of 150 tons of ¾-in. Leicester or Guernsey granite chippings, for the urban district council.

FELTHAM.—May 26th.—For the supply of 10,000 gallons of refined tar (Road Board Specification, No. 1), for the urban district council.—The Surveyor.

MARTLEY.—May 26th.—For the supply of 150 tons of granite, 450 tons of slag, 900 tons of granite, 300 tons of slag, and 200 tons of granite, for the rural district council.—Mr. H. L. Richardson, surveyor.

ASHFORD.—May 27th.—For the supply of 1,710 cub. yds. of 2-in. gauge broken granite and 320 cub. yds. of ¾-in. gauge granite chippings, for the urban district council.—Mr. W. Terrill, surveyor.

STOWMARKET.—May 27th.—For the supply of granite and flints, for the urban district council.—The Surveyor.

OLDHAM.—May 27th.—For making up certain streets, for the corporation.—Borough Surveyor.

ROWLEY REGIS.—May 31st.—For work of tar-spraying, for the urban district council.—The Surveyor.

WANTAGE.—May 31st.—For the supply and hauling of hand-picked stones and rubble, for the rural district council.—Mr. J. H. Robinson, surveyor, East Ilsley.

FINCHLEY.—May 31st.—For making up part of a road, for the urban district council.—Mr. C. J. Jenkin, engineer.

ELY.—May 31st.—For the supply of machine-broken Leicester granite, for the urban district council.—Mr. W. McKelvie, surveyor.

TILBURY.—May 31st.—For the supply of 10,000 gallons of approved refined tar, complying with the Road Board Specification No. 4 for Tar No. 1, also laying 1,000 sq. yds. bituminous-bound granite (graded), 1,000 sq. yds. of tarred slag macadam, and 1,000 sq. yds. of tar-paving, for the urban district council.—Mr. S. A. Hill-Willis, engineer and surveyor.

FINCHLEY.—May 31st.—For making up Holly Park, for the urban district council.—Mr. C. J. Jenkin, engineer.

PONTYPOOL.—June 2nd.—For the supply and hauling of limestone, for the rural district council.—Mr. R. O. Roberts, district surveyor, Usk.

WESTMINSTER.—June 10th.—For the execution of paving works and the supply of wood blocks, for the city council.—Town Clerk.

DURHAM.—June 11th.—For the supply of about 12,000 tons of granite cubes and other size granite setts, for the county council.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

LEWES.—June 18th.—For road rolling and the supply of 600 tons of 2-in. broken granite and 600 tons of broken surface-picked flints, for the corporation.—Borough Surveyor.

Sanitary.

FINCHLEY.—May 31st.—For the construction of soil and surface-water sewers, in connection with the Woodhouse estate workmen's dwellings scheme, for the urban district council.—Mr. C. J. Jenkin, engineer and surveyor.

Stores.

MANCHESTER.—May 26th.—For the supply of materials, for the Electricity Committee.—Mr. F. E. Hughes, secretary, Electricity Department, Town Hall.

BELFAST.—May 27th.—For the supply of stores, for the Gas Committee.—Engineer and Manager, Gas-works.

Miscellaneous.

WORCESTERSHIRE.—May 28th.—For sale, a 12½-ton roller by Aveling & Porter, also Morrison's patent road scarifier.—Apply, Mr. C. F. Coleridge, county surveyor, 30 Foregate-street, Worcester.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

DEVON.—For repairs and alterations to certain bridges, for the county council.—Mr. W. P. Robinson, county surveyor, Exeter:—

Paddon Bridge.

C. Duke, Plymouth	£129
E. Harris, Exeter	127

Yarty Bridge.

R. G. Spiller, Chard, Somerset	£232
E. Harris, Exeter	187
E. G. Coles, Taunton †	170

Axe Bridge, Hawkchurch.

E. Harris, Exeter	£190
R. G. Spiller, Chard, Somerset	179
E. G. Coles, Taunton	131

KIRKCALDY.—For the construction of a concrete toe at the loupin wall in Kinghal bay, for the corporation.—Mr. R. Henderson, harbour engineer, Edinburgh.

G. Smith & Sons, Kirkcaldy	£468
A. Fraser, Kirkcaldy	268

PONTARDAWE.—For the supply of cast-iron water mains, with valves, for the rural district council.—Mr. J. Morgan, engineer.

J. D. Howells, Brynamman	£342
P. Clarke, Pontardawe	314
D. Griffiths, Ynysmeudu	255
E. J. Hanney, Swansea	229

ROTHERHAM.—For the supply of stoneware pipe sewers, for the rural district council.—Mr. B. Iles, engineer.

Wand & Atkinson, Rotherham, £535.

SWANAGE.—Accepted for providing materials and labour for tar-spraying, for the urban district council.—Mr. W. H. Pearce, surveyor:—

H. V. Smith & Co., Westminster, London, 2d. per yard super.

EALING.—For the durchold drainage scheme, for the urban district council.

W. Jackson, Forest Gate	£1,612
Economic House Drainage and Repair Company	997
J. C. Turner, Blackwater, Hants	980
— Iles, Wimbledon	908
G. W. Pedrette, Leicester	899
Payne Brothers, Wadsworth	889
G. Wrapper & Co., Hammersmith	861
Wilks & Powis, Wembley	861
W. Lingwood, junr., Romford	846
W. L. Lovell & Son, Gerrard Cross	840
Lumley & Jackson, Slough	811
W. Wright, Chesham	800
Hanson, Southall	781

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MAY.

26. Institution of Municipal Engineers: Council Meeting in London. 5.30 p.m.
Institution of Electrical Engineers: Annual General Meeting.
28.—Institution of Municipal and County Engineers: North-Western District Meeting at Northwich.
28. Royal Sanitary Institute. Meeting at Shrewsbury. Discussion on "The Value of Mechanical Filters in the Purification of Water." 7.30 p.m.
29.—Institution of Municipal and County Engineers: Council Meeting.
29.—Association of Managers of Sewage Disposal Works: Visit to Wimbledon Sewage Works.
29. Institution of Municipal Engineers. Meeting at Dunstable.
31.—Surveyors' Institution: Annual General Meeting. 5 p.m.

JUNE.

4-5.—Institution of Municipal and County Engineers: Scottish District Annual Meeting at Ayr.
11.—Royal Sanitary Institute: Discussion on "Co-ordination of Military and Civil Sanitary Services in War-time." Bristol Guildhall.

(*Continued on p.* 662.)

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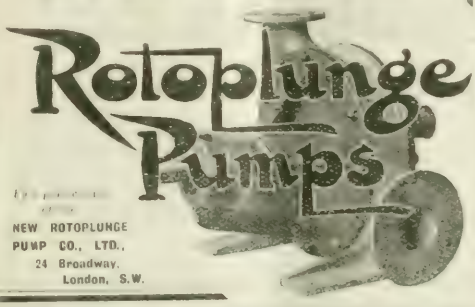

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AN APOLOGY.

The Government, during the last six months, has had first call upon our resources, orders having been received for nearly £20,000 worth of Portable Water Filters for H.M. WAR DEPARTMENT.

We are ahead of our stipulated time on this contract, and can therefore better offer our services to Public Bodies, Surveyors, and Civil Engineers, in connection with this branch of Hydraulic Engineering in which we specialise.

Advice given and complete specifications and estimates free of charge for Ejectors or Air Lifts, Water Filters, Softeners, or Sterilisers, and for all Apparatus in connection with the Raising or Purification of Sewage.

WATER LIFTING, FILTRATION, SOFTENING, STERILISING. **SEWAGE** LIFTING, PURIFYING, STERILISING.

JUNE.

12. Institution of Municipal and County Engineers Meeting at Matlock.
18. Institution of Water Engineers Summer Meeting in London.
23. Town Planning Institute Annual Meeting.
24-26. Institution of Municipal and County Engineers Annual General Meeting.
25.—Mr. Herbert Samuel opens the National Road Exhibition.

MISCELLANEOUS.

WANTED, to purchase, a second-hand Water-cart. Particulars and price to be sent to Mr H. Webb, District Surveyor, Epping. (2,579)

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

CANNOCK URBAN DISTRICT COUNCIL.
FOREMAN.

The above-named Council invite applications for the post of Foreman for part of the District.

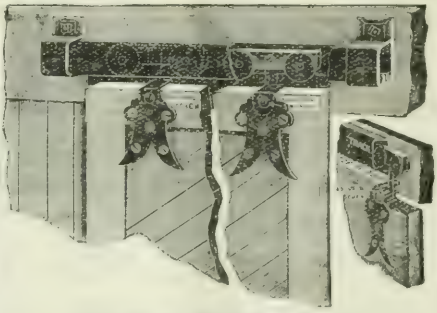
Applicants must have had experience in the control of men for Street Scavenging, Watering, Road Making, Tarmacadam, Spraying, Paving, &c., and be able to undertake the inspection of Sewers, Drains, and Buildings.

Wages 35s. per week.

Applications, in candidate's own handwriting, to be addressed to the Chairman of the Council, Council Offices, Cannock, and endorsed "Foreman," must be delivered not later than noon on Friday, the 28th of May, 1915.

ROBERT BLANCHARD,
Engineer and Surveyor.

May 13, 1915. (2,574)



No door is too big, too small, or too awkwardly placed

to be hung on Coburn Track. The brackets are supplied in shapes and sizes suitable for doors of any weight in any position.

The roller-bearing runners move without friction in the round trough track, and the doors slide easily **always**, because the working parts do not become clogged with dirt, or rusty, being protected by the covered track.

COBURN ROUND TROUGH Steel Tracks

Coburn Track is cheap, and easy to fix, and we shall be pleased to give information by return of post on the best methods of hanging sliding doors.

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The Surveyor

And Municipal and County Engineer.

Vol. XLVII. — MAY 28, 1915. — No. 1,219.

Minutes of Proceedings.

Manchester Corporation and "Unfit" Property.

A judgment of considerable interest and importance has been given recently by the House of Lords on the question of property that is alleged to be "unfit for habitation." The appeal was by a property owner against the Corporation of Manchester with respect to the proposed action of that authority under sec. 11 of the Manchester Act of 1867. The section places the corporation in what is virtually the position of arbitrator to determine judicially whether a building is or is not unfit for human habitation, with an appeal to Quarter Sessions. The chief point discussed in the judgment was the term "unfit for habitation," customarily used in connection with municipal authorities, and with respect to it the Law Lords, Lord Dunedin, Lord Parker, and Lord Sumner, indulged in some very ingenious deductions. Lord Dunedin described the phrase as "a very elastic expression," and altogether different from "not up to modern or model requirements," though what these latter may be he refrained from saying. If, he argued, the term is applied to a house as a whole, "it must mean the most and every thing is unfit . . . a result which, in the debate is worth 1 vote but 1 he could regard as conveying being arrived at when there are rooms with window [illegible] a yard." Lord Parker sought to improve upon this by contending that if the corporation wished to decide whether a house was unfit for human habitation, "reference must necessarily be made to some standard of fitness or unfitness," and he added that "the fact that the corporation [illegible] a certain standard of fitness which they desire to impose on the area subject to their jurisdiction, and that the building in question falls short of that standard, will not, in my opinion, necessarily render the house unfit within the meaning of the section."

These intellectual subtleties, when viewed in relation to each other, would appear to lead us into something very like a literary morass. We are not thereafter rescued from such an unpleasant position, but rather plunged deeper into the mire when we find his lordship saying further: "The standard to be applied would seem to be that of the ordinary reasonable man. This test may seem vague, but it will be found quite sufficient except in cases on the border line, and in such cases the corporation will proceed at its own risk, and must expect litigation." Lord Sumner discussed the matter interrogatively, asking among other things if a house which had been fitly inhabited for over half-a-century could be unfit for human habitation; and again, Was it unfit even though the backyard, with or apart from adjacent buildings, provided scanty ventilation or light to a [illegible] or a staircase window, the living-rooms being well lit and well ventilated? These speculations and questionings would seem to prove that local authorities who have so long and so freely made use of the term "unfit for habitation" in the endeavour to obey the law have undertaken a responsibility which is vastly greater than they bargained for.

Failures in Concrete.

The importance of the study of failures [illegible] in engineering practice can hardly be over-estimated, and it was therefore with great interest that we read an excellent article in the May issue of our contemporary *Ferro-Concrete*, in which the causes of failure in reinforced work were examined and the methods to be adopted for avoiding them were discussed. It is [illegible] that every failure in concrete work is due either to inadequate design, inferior materials, or bad workmanship. Hence the supreme importance to the building owner of securing the services of a thoroughly competent designer, and of having the work carried out by experienced workmen under the supervision of an expert contractor. So far as reinforced concrete is concerned, there have been very few actual failures in this country, but these and the more numerous mishaps which have occurred abroad point to certain definite causes of failure. Chief among these are inadequate design, misplacement or omission of reinforcement, bad material or workmanship, insufficiency of moulds or centering for temporary support, and the premature removal of such moulds or centering. The last mentioned is by far the most frequent cause of failure, but represents a mistake not at all likely to be made by experienced contractors. Inadequate design may result from lack of experience, and is most unfortunately encouraged by the pernicious system of inviting competitive designs. Errors in the application of reinforcement and in the preparation and placing of concrete are obviously preventable by efficient

supervision on the part of the contractor and the clerk of works or resident engineer.

One particularly suggestive characteristic feature of reinforced concrete work is that no failures have been known to occur after the completion and hardening of the concrete. This point constitutes definite proof of the fact that the comparatively few mishaps so far recorded have been the result of errors or carelessness in construction. Equal proportions of stone, brick, timber and steel structures have failed during or immediately after construction for similar reasons. Moreover, many structures of these classes have collapsed at varying intervals after completion, and as the result of gradual decay. On the other hand, the history of reinforced concrete gives the assurance that when a properly designed and carefully built structure has once been completely finished it is perfectly safe, and will go on increasing in strength and durability from year to year.

* * *

Dry Closets. In our issue of April 16th last we made some plain comments on the endorsement of the dry closet system by the Royal Commission on Sewage Disposal, as expressed in their Ninth Report. We then pointed out that, although theoretical considerations might warrant the use of the earth closet and the ashpit privy, the abominations which invariably accompany their adoption in practice are such as to render it almost impossible to believe that the suggestion that the system applied to a large village would meet with the approval of the Royal Commission. On this point, however, the report leaves little, if any, room for doubt. For example, we are told that "a system of dry closets may be open to little objection," and that "in small communities the removal of the contents may generally be left to the householder," while "in larger villages it may with advantage be undertaken by the local authority." The article to which we have just referred concluded with a suggestion that it would be of general interest if those of our readers whose experience included the extensive use of earth closets or of privy ashpits would communicate their opinions on this very important matter. In response to that invitation we have received a vigorously worded communication from a rural district surveyor, whose only complaint of our former comment is that it was couched in terms which were too moderate for the occasion. The principle underlying our contributor's contentions is that there is but one standard of cleanliness, which is just as necessary—indeed, more so—for the cottage dweller and his family than for the cottage owner. Even if it be granted that the earth closet and ashpit privy are model sanitary appliances if properly used, there are two great facts which render them only too frequently insanitary in practice. One is the prevailing popular ignorance of the danger to health of [illegible] accumulations, and the other is the impossibility of securing that continuous and unremitting care on the part of every user which is essential if proper conditions are to be preserved. Hence the force of our correspondent's paradoxical proposal to give the flow a good fall from the back wall to the sill, so that the filth may temporarily cause as much personal nuisance as possible by running under the feet of the user from the leaky and overflowing pan. If it were possible, as in all cases, to prepare a separate block plan of every house and its outbuildings in a small typical village, showing the methods of water supply and drainage, together with statistics of sleeping accommodation, sanitary defects and other matters affecting the health of the occupants, we believe that the results would surprise even the most ardent sanitary reformer.

Surveying and Field Work.* This, the latest addition to the many published works on "Surveying," is one of the useful series of "The Glasgow Text-books," of which Prof. G. Moncur, B.Sc., M.Inst.C.E., the Professor of Civil Engineering in the Royal Technical College, Glasgow, is the editor. A practical knowledge of surveying and levelling forms the groundwork for all civil and municipal engineering work, such as sewerage or waterworks, roads, bridges, and other constructional works, and this book offers safe guidance on the subject to the students and pupils for whom it is primarily intended. It is simply and clearly written, and well illustrated with 270 specially prepared plates, and though it does not deal with the more advanced forms of geodetic surveying and astronomical work, it contains all the practical information on the subject of surveying that the majority of practising engineers and surveyors are likely to require.

The chapters on chain surveying are of a very complete and practical character, though the author, like so many other writers on the subject, falls into the mistake of relying on two lines for ties for offsets where three are required for accuracy. The necessity of ties for offsets for fences is not very apparent, as they are generally plotted to a small scale, and where it is necessary to fix the corners of a house or an important junction a third line prevents any danger of mistake in plotting. Plus signs should be given where offsets or measurements are not running measurements, figures outside the hatching of the houses should be clearer, and a double line for the survey lines frequently avoids confusion of offsets with measurements. Town surveying might with advantage have been more fully treated, as this branch of surveying is to most engineers of greater importance, and presents more difficulty than country work. The 1/2500 Ordnance plans are practically kept up to date by revision by the Ordnance Survey authorities, but they do not now revise the 1/500 plans without payment from the municipal authorities, and the work consequently falls on the borough engineer's staff. The book contains much useful information on traversing, levelling, contouring, setting out of curves, and calculation of areas, and it will be a valuable addition to any engineer's library.

The Use of Lime Concrete. In 1909 a paper on the use of lime concrete in the East was presented to the Concrete Institute by Mr. E. A. W. Phillips, M.Inst.C.E., a former superintending engineer to the Burma Public Works Department. The object of this paper was to show that the introduction of a proportion of Portland cement to lime concrete as made in India and Burma has a material effect in hastening the setting to an extent depending on the proportion of cement added. This paper recently came under the notice of Mr. H. Kempton Dyson, who was so impressed with the importance of the questions raised that he took steps to secure the carrying out of a series of experiments for the purpose of testing the accuracy of the assertions made by Mr. Phillips. The experiments were actually carried out by the last-named gentleman, and the results are embodied in a further paper which was read at a meeting of the Institute held last week. In his concluding remarks the author points to the desirability of still further experiments, and expresses the opinion that, if carefully carried out, the results would undeniably encourage the employment of cement to improve lime concrete at comparatively small cost. It appears that

* By James Williamson, Assoc.M.Inst.C.E. Price 7s. 6d. net. London: Constable & Co., Limited.

cement has been employed for this purpose in India ever since Portland cement was first manufactured, and that the results have been entirely satisfactory. For example, between 1871 and 1875 Mr. Harcourt, the engineer charged with the construction of the Ravi Bridge and other works in connection with the Punjab Northern Railway, employed Portland cement, mixed with local lime in various proportions, in order to expedite the setting of the mortar. Unfortunately, he preserved no records as to the exact materials used, but his evidence goes generally to confirm the conclusions arrived at by Mr. Phillips. In undeveloped countries cost alone usually precludes the use of cement in large quantities, and the use of mixtures is therefore a practical necessity. This being so, Mr. Phillips's experiments are valuable as tending to substitute a scientific basis for the rules of thumb which have hitherto prevailed.

* * *

Incendiary Fires. Some useful and practical suggestions for coping with outbreaks of fire caused by incendiary bombs from aircraft are put forward in a memorandum which was issued last week by the British Fire Prevention Committee. The committee point out that the various fire brigades cannot be expected successfully to deal with any large number of outbreaks, and that their attention would in any case be primarily devoted to fires affecting Government offices and shipping engaged on Government work, military stores, docks and hospitals, and so forth, rather than to private property or semi-public property, however valuable. In their opinion, therefore, it behoves all owners and occupiers of such premises to do their best to organise for self help. Innumerable establishments, such as factories, warehouses, stores, modern office blocks, flats, hotels, and large private houses, as also semi-public establishments like schools, baths, theatres, music halls and assembly rooms, are equipped with internal hydrant services and first-aid fire appliances. These, it is suggested, should be promptly examined, and the staffs—both male and female—frequently practised in handling the gear. Unskilled establishments, such as shops, offices, and ordinary domestic buildings, should have an ample supply of buckets kept ready filled with water—and where funds permit, one or more small hand pumps. Occupants should be taught to use these appliances efficiently. Every effort should be made by the public to assist the fire brigades in their onerous duties, but they should not call on any account immediately to notify by telephone or otherwise, any outbreak that comes to their notice. The method of calling assistance to be posted up in a conspicuous position. In any event, the British Fire Prevention Committee consider the public would be well advised to have these matters attended to at once, and should remember that fires caused by incendiary bombs, if promptly tackled with water in fair bulk, forecasts a calamity, need not spread, and are not quite the terrifying peril to be dealt with that the enemy would make them.

* * *

The War and Appointments. We have already called attention to the hardship which may be imposed upon those officials who have answered their country's call, by reason of the fact that for the period of the war they are precluded from making application for new appointments. The Local Government Board have now issued a circular containing suggestions, the effect of which will incidentally be to mitigate this hardship, although their primary object is to prevent the appointment, for the time being, of young men of military age. The suggestion made by the board is that whenever vacancies occur, and it is unlikely that candidates suitable for permanent appointment who are not eligible for the Army or for special work in connection with the war can be obtained, the local authority should consider first whether it would be possible by a rearrangement of duties among other officers to avoid any fresh appointment during the period of the war; and that if this should be found impracticable, they should endeavour to secure the services of any retired officer with the requisite experience who might be able and willing to act during that period; or failing this should engage persons temporarily, who are not eligible for the Army or the special occupations, as recommended in the previous circular in the case of substitutes. The board recognise that persons so engaged may not always possess the same standard of qualification as would be required in the case of permanent appointments, but this difficulty may be overcome if it is made clear to them when engaged that the employment is only temporary, and that permanent appointments made after the war will be subject to all the ordinary conditions.

* * *

Forthcoming Meetings. From now until the end of June there will be no lack of meetings of professional societies, though it must be admitted that fixtures are not quite so abundant as in previous years. At Shrewsbury this evening there is every promise of a most instructive discussion on the value of the mechanical filter in the purification of water, the occasion being, as we announce elsewhere in this issue, a meeting of the Royal Sanitary Institute. To-day, also, the North-Western District of the Institution of Municipal and County Engineers meet at Northwich, where, in addition to the customary descriptive paper—which Mr. J. Brooke, the engineer and surveyor to the district council, will submit—the proceedings will include an interesting round of visits to municipal and other works. Next Saturday will see two further meetings of the same body, one at Southall, Middlesex, and the other at Ayr. It will be the institution's second visit to the historic Scottish town, and a glance at the excellent programme will make it clear that the gathering is likely to prove a strong attraction to Northern members. The Institution of Municipal Engineers and the Association of Managers of Sewage Disposal Works are meeting to-morrow at Dunstable and Wimbledon respectively; and among other important arrangements for the near future are the summer meeting of the Institution of Water Engineers—which, owing to the war, is to take place in London instead of at Belfast as originally intended—the annual meetings of the Institution of Municipal and County Engineers and the Town Planning Institute, and the opening of the National Road Exhibition.

North Riding Main Roads. The report of the county surveyor, Mr. W. G. Bryning, upon the main roads of the North Riding of Yorkshire for the year ended March 31st, which was presented to the council recently, refers to the effects of the war upon road works, caused by the shortage of men, horses and materials. The increase in the motor-car traffic, Mr. Bryning proceeds to state, is undoubtedly very large, and, as previously reported, the water-bound macadam on the principal main roads is found to be expensive and unsuitable, as it is rapidly broken up. It is most desirable for efficiency and economy that the amount of bound material put down should be greatly increased, and that the surfaces of the best sections of water-bound macadam should be tar-sprayed to prevent them being disintegrated under this traffic.

Municipal Buildings, Gourock.

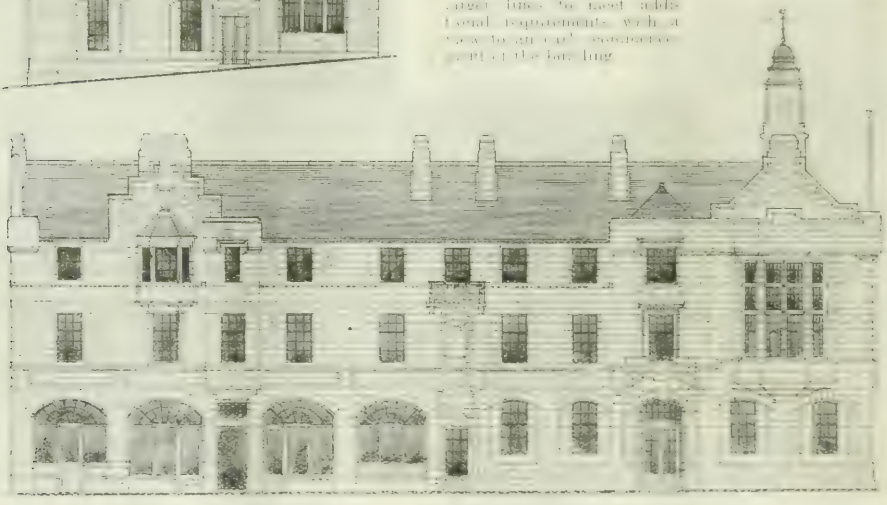
The selected design for the new municipal buildings at Gourock, which we illustrate herewith, is that of Mr. Alexander N. Paterson, M.A., A.R.I.B.A., 266 St. Vincent-street, Glasgow.

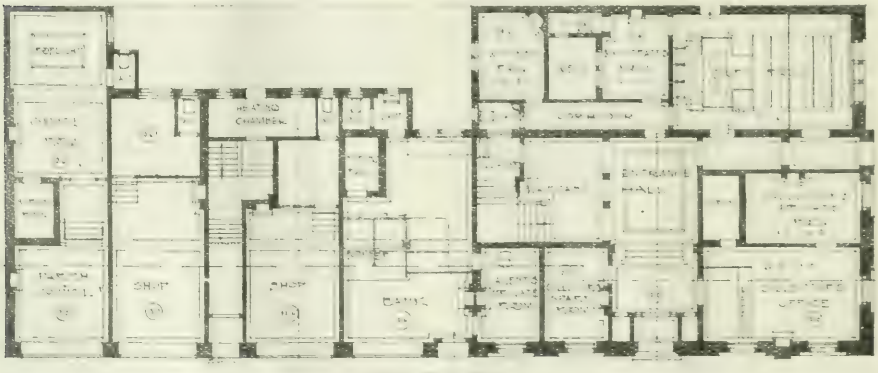
The site at the corner of a place [illegible] the main part open on one side to the Esplanade and Clyde, and a somewhat narrow street leading out of it southwards. The short front faces the former, while along the latter an extended but very narrow block has been acquired, rather more than one-half of which is to be utilised at present.

The accommodation required consisted of a council chamber, with the usual municipal offices of limited dimensions, and a burgh court room, together with lettable subjects in the form of premises for the local estate office, the parish council, shops, and three and four roomed houses. A tower was also suggested, but the sum allowed under the conditions (£7,000) was already quite insufficient for the provision of the required accommodation without such a desirable adjunct.

The position of the court room was fixed in relation to the police buildings to be erected alongside. The council chamber, as giving the only opportunity for architectural development and emphasis in elevation, appeared to call for the most prominent situation on the angle of the building. From this, with the necessity of some feature to mark the centre of the front, as ultimately to be extended, the arrangement of the plan and the design generally, including the style adopted, seemed to develop naturally.

The design was placed first in a limited competition by the assessor, Sir John J. Burnet, and, having been accepted by the town council, is now developed on larger lines to meet additional requirements, with a view to an early commencement of the building.





General Floor Plan

[illegible]

Gourock Municipal Buildings.

LIME CONCRETE IN THE EAST.*

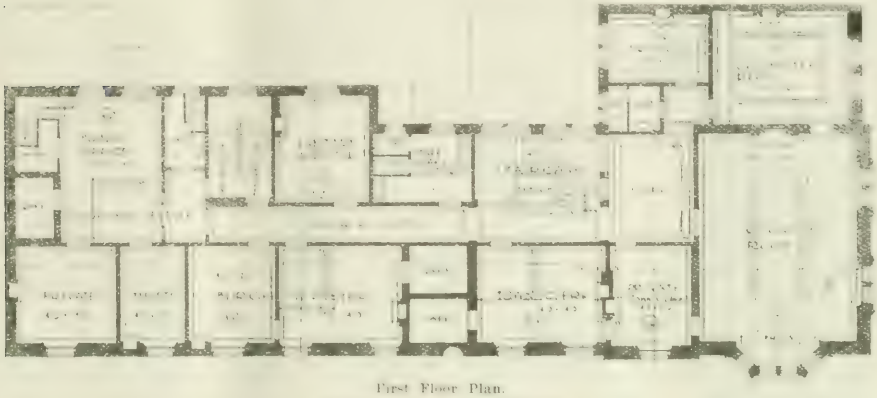
By E. A. W. Pettitt, M.Inst.C.E., M.I.

[illegible] confidence in the material. To enable it to set under water [illegible] "Soorkhee," the [illegible] not know exactly how much soorkhee is required by each kind of lime, and this ignorance is due to the want of scientific laboratory tests of the kind so frequently made in Europe. It seems no advantage to send lime and soorkhee to England to be tested, since the difference in climate, the sea voyage, and the lapse of time in transit might vitiate the results. Conservative Indian opinion, based on long experi- [illegible] with 1 part of [illegible] lime and 1 part of sharp, clean sand, all measured in bulk, dry. The materials are thoroughly incorporated and ground in a mortar mill, either under one wheel pulled round a circular track by a bullock or in a pan machine under a pair of wheels. The mortar should be a thick reddish paste, in which the particles of lime cannot be distinguished by the naked eye. A mortar made in this way sets very well indeed in still water, but it sets comparatively slowly, and some engineers (the author included) add, when necessary, a proportion of Portland cement to the mixture. The introduction markedly hastens the setting to an extent depending on the proportion of the cement to lime; 1 part cement to 1 part lime by volume sets apparently as quickly as cement mortar. In the early stages of setting the strength of the concrete is much increased, admitting of early handling and removal of moulding boards. The addition of cement preserves soorkhee mortar in wet foundations from the evils of percolation, and the cement besides seems to have a chemical effect on the lime, fixing the particles and aiding in a more solid set.

First-class soorkhee mortar, several centuries old, it has been asserted, exceeds Portland cement mortar, 1 to 3, in strength and impermeability, and is said to be often equal to 1 to 2½. In regard to economy, there is no comparison in Rangoon, cement costing [illegible] about two rupees per cubic foot and lime only three-tenths of a rupee per cubic foot. Further, in comparing the two classes, it has to be remembered that, while native Indian masons are very clever in dealing with lime, they often make bad mistakes in dealing with Portland cement, and have to be specially taught its use, and carefully watched besides, as they are stupidly stubborn.

Where a mortar mill cannot be obtained, or when the work is too small to justify the expense, stone lime is thoroughly slaked by being steeped for twenty-four hours or a week or more in fresh water, being kept constantly covered and stirred at intervals with a rod. The result is a perfectly slaked lime and a breaking up of all but the very hard particles. The wet lime is first mixed very thoroughly with the sand, the particles of the sand tending still further to break up and subdivide the lime. Soorkhee, very finely hand-pounded and screened, is then added in small quantities, and if the operation is properly done it should be a little difficult to detect that the mortar has not been prepared in a mill. This is the best native Indian practice when a mill cannot be got. Tradition asserts that the stone lime in the Taj Mal of Agra was steeped in water nearly a year before use.

The author then gave a description of a number of experiments which had been made by himself and others as to the effect of adding lime to Portland cement in making mortars and concretes—namely, as to the effect upon the setting time of cement, the tensile strength of the mixture, the effect of lime in increasing the resistance to percolation of water through cement mortar, and the crushing resistance to concretes and mortars made with varying proportions of cement and lime. Some of the results [illegible] with a small proportion of Portland cement and added lime and crushed brick. The author pointed out the advantage of employing lime in the East where carriage upon Portland cement increases its cost very greatly. The conditions that prevail everywhere in rough, undeveloped lands rendered the matter of the highest importance that cements can be utilised as described. The author urged that further investigations were desirable because of the absence of reliable tests. At present we are working in the dark by rule of thumb.



First Floor Plan.

[illegible]

* Abstract of paper read at the last meeting of the Concrete Institute.
† "Soorkhee" in India is finely powdered red brick.

Fire at Middlesbrough Baths.—Between £1,000 and £2,000 damage was caused by fire at the Middlesbrough Corporation Baths on Monday.

Mechanical Haulage.—Mr. E. F. Willson, surveyor to the Kingsbridge (South Devon) Rural District Council, will be glad to receive information from surveyors to other rural councils who have adopted a system of haulage of materials by mechanically propelled vehicles.

Road Maintenance at Skegness.—In his report for 1914 the engineer and surveyor to the Skegness Urban District Council, Mr. R. H. Jenkins, states that at the end of the year there were 7 miles of highway repairable by the town, and that the total cost of maintenance was £771, or about £110 per mile. Mr. Jenkins remarks that the expenditure on this work was curtailed on account of other extra and pressing necessities, but the strain on the roads becomes greater each year, and on account particularly of the weak foundations of many of the older highways in the town the surfaces quickly collapse if not repaired at the proper time. The surface-tarring of the roads has been extended from 39,258 yds. coated the previous year to 77,040 yds. during the year under review, but there are still considerable lengths of road which, Mr. Jenkins thinks, should be treated as soon as possible. The total cost of this work was £280.

Glastonbury Sewage Works.*

By A. P. I. COTTERELL, M.INST.C.E., Engineer to the Scheme.

The Glastonbury Corporation have constructed three settlement tanks on their farm at Cradlebridge, together with storm-water sludge lagoons and irrigation area.

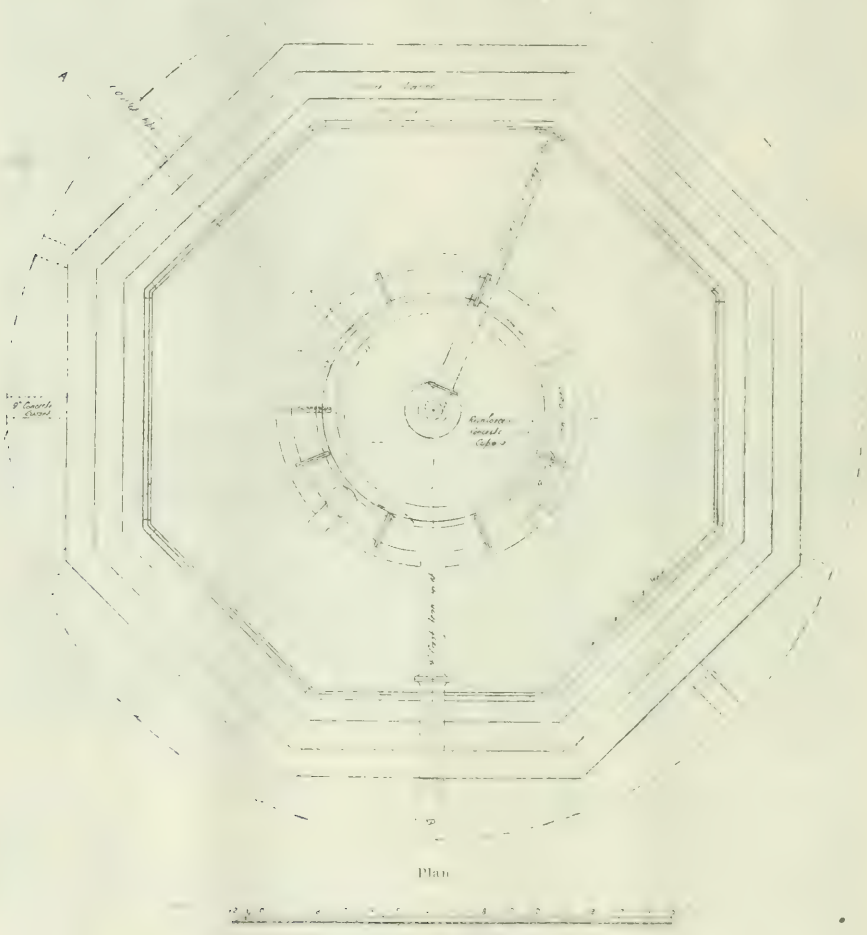
Each tank has a capacity of 26,666 gallons, and is built of concrete. It is designed on the sludge-digestion principle—viz., with an inner septic chamber and a vertical flow annular settling tank. Great difficulties were experienced in the construction, the peat being at least 30 ft. deep, and no solid foundation obtainable. Each tank was sunk as a concrete monolith with a cutting edge, the ground being excavated from inside, and as it dropped the monolith was added to above. The bottom is in soft slurry that constantly rose in the excavation like very viscous syrup.

On reaching the required depth a rough plank floor was quickly put in, stiffened by steel joists against the upward pressure. A concrete moulded centre was then inserted and the concrete base constructed, the water being meanwhile kept down by pumps. The tanks are now floating in the moor.

At Porchestall Drove it was at first intended to insert a circular concrete storage tank of 75,000 gallons, but the work had to be abandoned for the same reason as above named.

Three concrete caissons, each 15 ft. diameter, were substituted, and they have been sunk to a depth of 42 ft., where a solid clay bottom was found. Each tank is connected at the base, and inside one of them is an inner chamber which contains the pumps. The engine-house is built on top of the tanks.

An inverted syphon, over 2,000 yds. in length, runs from the town to Cradlebridge. The Porchestall tank is at its lowest part, and will be utilised both for the low-level area of Glastonbury, near the station, and for cleansing the syphon. From the Porchestall tank the sewage is pumped over a standpipe into the western end of the syphon.



Plan

GLASTONBURY SEWAGE WORKS.

New sewers have been laid in the Northover area draining to Porchestall. Difficulty was experienced in laying the outfall sewer through the peat, but it was overcome by constructing it in cast-iron with turned and bored joints.

The pumping machinery at Porchestall is in duplicate, each set consisting of a [illegible] engine, driving by means of belt drives a 4-in. Stereophagus pump. These pumps are of the centrifugal type, and are so designed that they are capable of pumping unscreened sewage. A [illegible] with

* Presented at a meeting of the Somerset Surveyors' Association at Glastonbury on Saturday the 15th inst.

gearing is provided, so that each pump can be driven by either or both engines as desired.

There is a further pumping station at Northload, serving a population of about 250. The sewage gravitates to a storage tank at this station, and is pumped therefrom through a 6-in. rising main into the high-level sewers. The storage tank is circular, 22 ft. 6 in. diameter and 10 ft. deep, built of concrete with a brick lining. The engine-house is similar in design to that at Porchestall, and is built directly over the storage tank.

The machinery at Northload is also in duplicate, and each set consists of a 4·5-b.h.p. gas engine, driving a 2-in. Stereophagus pump with belt drives and countershafting, as at Porchestall.

The total population served by the works is about 4,000, and the cost of their construction has been £11,541.

DRY CLOSETS—SO CALLED.

By A RURAL DISTRICT SURVEYOR.

Your leader of April 16th is none too strongly worded, and were I master of the English language I would pen a paragraph in a much more lurid strain.

The hopelessness—the helplessness of a sanitary inspector, conscious of being the servant of a set of smug farmers and small owners, they in turn being the cringing tools of the larger owners of property, who repeatedly ignore the strongest possible reports as to the foul, bestial conservancy system of deliberately storing all fæcal matter sometimes within 6 ft. or so of the kitchen door or larder window, is positively humiliating.

One finds these closets in all sorts of places, abutting on the dairies, kitchen chimneys (thus encouraging fermentation), and the larder, and, at a higher level, with the urine from the leaky pans impregnating the walls, and even flooding the floors where the food and baby's milk are kept.

With a sufficient drain, sewer and water supply available, it is positively wicked deliberately to hinder the officer from serving the necessary notices, and it is not fair to those ratepayers who have paid their shot in the construction of a sewer and water main, and who still have to pay their share of scavenging these filthy holes and pans.

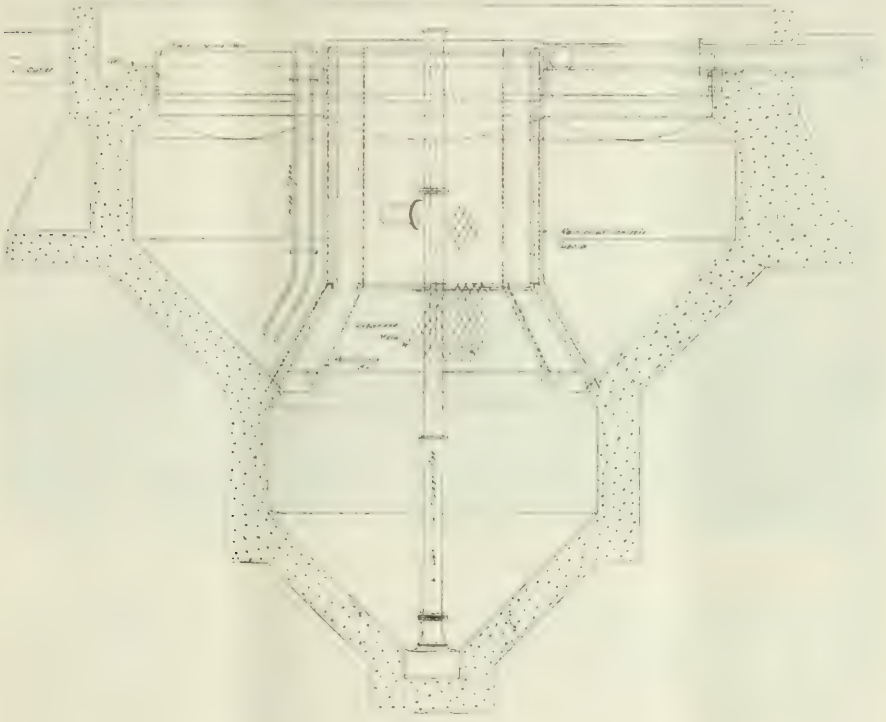
Pan closets, or "dry" closets, forsooth! Not one in a hundred is there that is dry; rather does one find 25 per cent in such a state that the stuff slops over and splashes the men who are obliged to handle it.

It is, thank goodness, more and more difficult to get men to take on this work, and may the time soon come when no man will be obliged, or found willing, to undertake such foul work when it can be avoided.

"Serve a notice on the tenant" is utterly useless where no scavenging scheme exists, and where, therefore, the tenant may be responsible, for before the necessary formalities are completed the vile thing has been emptied and is again half full.

Not one person in one hundred attempts the admixture of dry earth or ashes to the contents of the closet.

Where the writer does give a hint on the construction of pan closets it is—"Give the floor a fall of ¼ in. to the foot, from the back wall to the sill."



Section A B.

GLASTONBURY SEWAGE WORKS.

If constructed with a recess in the floor with a trap door at the back, as illustrated in Model by-laws, many would never trouble to empty it, as long as the stuff got away somehow, no matter where.

If no proper water supply is available to furnish the necessary flushing from a cistern, do it with a pail, anything to get rid of it rather than to have it handled. . . .

I wonder how many of the commissioners having residence in the area of a rural authority use pan or earth closets? A fairly long experience has taught me that the rural councillors usually have a water-closet of some kind on their premises wherever possible. By all means cast all public health work on the county council, or, better still, the Local Government Board or a Board of Health, if such a body

will encourage its officers to remove the festering cancer from among us.

There is but one standard of cleanliness, and that is just as necessary—indeed, more so—for the cottager and his family than for the owner of the cottage.

If, as is so often the case, the owner becomes financially incapable of maintaining his property in a reasonable condition, the sooner the local authorities, the county council, or the Local Government Board step in and assume ownership, at a valuation, the better and cheaper for the community at large.

The waste of time in this one branch of routine work is alarming. An abstract from the sanitary inspector's work, as published in the annual report of a Midland county medical officer of health, shows 8,467 nuisances arising from ashpits and privies, with the consequent entries in notebook, journal, letters and revisits reaching, in some cases, 33 per cent of the total work on this one subject, which should be practically automatic.

The men who hold the reins even go so far in the systematic and continuous effort to curb the ardour of their officer as to propose and second a wordy, vapoury minute that, where garden ground is available (little or much, and garden paths included), no steps shall be taken to enforce the alteration of existing closets, and were not the clerk to advise them that such a resolution would have no effect, and they cannot restrain the sanitary inspector, the minute would be carried unanimously: so the chairman politely calls the officer's attention to the manifest feeling of the Bumbles, and sagely advises him that it may be best for him to meet their views.

If he be ardent, enthusiastic, efficient, sure of his ground, and has committed no great indiscretions around his district, he will still threaten, cajole and jockey many owners into doing the necessary work, and disregard the consequences as long as he gets the work done somehow. That he suffers for it no one doubts, and no one knows that better than himself, for even sanitary inspectors do occasionally ask farmers and small builders for slight additions to a pitiful salary, or for the provision of a second-hand push bicycle, or the maintenance thereof.

There is, of course, the satisfaction of feeling that he is improving the lot of general humanity; there is also one other satisfaction—the thanks, often many months after, but rarely forgotten, of a grateful cottager for a nuisance removed, and of which he or she has not dared to mention to the squire, or, worse still, his autocratic agent, for fear of a polite but frigid intimation that the cottage was "required next month for a new tenant."

For the tenant, more often than not, is charged with sending for the sanitary inspector, and the repudiation, backed by a pathetically written appeal to the officer to substantiate a negative, is only half believed.

To obviate the cruel wrong, every house in the land should be officially visited once every two years, instead of, as is now sometimes the case, but once in a lifetime, and no void house should be reinhabited without a certificate from the sanitary authority, which should not, in my opinion, be the local one—unless the public health officer be first given the security of tenure.

It has long been in the writer's mind to prepare a separate block plan of every house and its outbuildings, in a small typical village, showing water supply drainage, ashpits, &c., number of bedrooms and their cubical contents, together with a card system recording the cause of every death, case of infectious disease, drain obstruction, date of visits, and sanitary defects discovered; but youthful ardour is gradually squeezed out of existence by the routine working of a 90 square mile district single handed, to say nothing of the deliberate invitation of one's paymasters to use green spectacles.

ALEXANDRA SCHOOL, HOUNSLOW.

The Alexandra School, Hounslow, is the second school which Mr. J. G. Carey, Assoc.M.Inst.C.E., the engineer and surveyor to the Heston and Isleworth Urban District Council, has designed for the Education Committee of that body. The first school (the Central Schools, Isleworth), erected in 1910, at a cost of £8,000, was a departure from the central hall type, and the committee, for whom Mr. Carey acts as architect and surveyor, were very pleased with the design and the result. In the present instance the committee have every reason to congratulate themselves, as Mr. Carey has designed a school which obtains for the teachers and scholars the best possible conditions under which to prosecute their studies.

The school is of the quadrangle type, and is, we believe, the first of its kind in Middlesex. The leading idea in the planning was to secure natural cross ventilation to the classrooms, and to form a sheltered space for open-air teaching and for physical exercise. Cross ventilation has been secured to all the classrooms, in the case of two classrooms [illegible] two external walls, this [illegible]

(*Mr. J. G. Carey, Assoc.M.Inst.C.E., Architect.*)

New School at Hounslow.

by ventilating through dormer windows over the roof of the corridors. A sheltered space for open-air teaching and for physical exercise is provided for by the quadrangle. The assembly hall, which forms one end of the quadrangle, is isolated from, although adjoining the classrooms. This is much appreciated, as the use of the hall for educational or other purposes does not interfere with the work of the scholars in the several classrooms.

The provision of a medical inspection-room with waiting-rooms is an innovation, and has enabled the Education Committee to establish a school clinic for the treatment of ringworm and ophthalmia cases.

The elevations of the buildings are mainly in grey stock brickwork, with blue brick plinths, red brick and artificial stone dressings; the front elevation, which includes the administrative offices, is built in silver grey facing bricks with reliefs as before described, and the general result of the architecture, while not in any way lavish or expensive in treatment, is very pleasing, and forms a notable addition to the public buildings in Hounslow.

The schools provide for 840 scholars (420 boys and 420 girls), and the cost is £13,000, for the whole of the school buildings, playsheds, latrines, fencing, playgrounds, caretaker's house and contingent works, which were very considerable owing to the difficulties of the site—which also demanded the construction of a foul-water sewer for the purpose of drainage.

The [illegible] works was Mr. W. [illegible], of Hounslow, and the heating system was carried out by Messrs. Kite & Co.

THE SURVEYORS' INSTITUTION.

PROFESSIONAL EXAMINATIONS, 1915.

The following candidates have passed in the Final Examination:—

Messrs. B. C. Adkin,* Bromley, Kent; A. M. Aldous,† Putney, S.W.; W. W. Berry, Kingston Hill, Surrey; F. Burdass, Beverley; A. de M. Chesterman, Bath; M. V. Davies, Aberystwyth; D. Evans, Meifod, near Welshpool; T. J. Evans, Porthcawl; W. C. Evans, Port Talbot; H. Fayers, Watford; H. E. Gillett, Highgate, N.; W. F. Gurney, Dartmouth Park, N.W.; H. P. Haggett, Newport, Mon.; W. Hill,¶ Egremont; G. S. Jennings, Moseley; H. D. Johnson, Middlesbrough; H. W. Lindsley, Sunderland; A. D. Longley, Beckenham; I. W. Morgan, Brecon; A. Morwood, Sidcup; E. J. Phillips, Bedford; R. Pollard, Accrington; T. Raddall, Callington; S. M. Sawyers, Newcastle-on-Tyne; J. Scott, Winchmore Hill, N.; E. G. Shoosmith, Bedford; A. E. Smith, Plumstead, S.E.; P. D. Sturge, Bristol; R. T. K. Thomas, Leeds; E. J. C. Vint, Aspatria; P. W. Walley, Frankton, near Oswestry; T. H. Walter, Forest Hill, S.E.; H. E. Whorwell, Dover.

* Beadel Prize. † Special Prize. ¶ [illegible]

The following non-students have passed in the Intermediate Division:—

Messrs. J. H. Alden, Hull; E. C. Annakin, Beverley; E. A. Arblaster, Sutton Coldfield; H. B. Bagley, Ipswich; G. W. Baker, Treorchy; H. P. Barnes, Usk; F. Baxter, Stanmore; R. D. Bennett, Wallington; C. E. Berry, Leytonstone, E.; H. B. Bescoby, Hastings; W. E. Blackett-Ord, Earl's Court, S.W.; R. L. Bland, Hammersmith, W.; T. H. Bletsoe, Thrapston; P. T. C. Body, Reading; G. G. Bourne, Burton-on-Trent; T. Boys, Golder's Green, N.W.; C. H. Buckley,* Tollington Park, N.; F. A. Buller, Putney, S.W.; R. E. Bullivant, Bristol; D. Burnett, Hereford; R. H. Burr, Palmer's Green, N.; G. T. Christie, North Ferriby; A. Clark, High Barnet, N.; W. Clowes, Paignton; A. J. Codling, Forest Gate, E.; D. R. Cogswell, Portsmouth; P. R. Cossham, Cirencester; A. B. Crosby, Wolverhampton; J. T. Currie, Urmston; H. C. Daly, Edgbaston; A. Davies, Carnarvon; T. W. Davies, Clapham Common, S.W.; S. J. Dimmock, Doncaster; F. C. Draper, Reigate; R. Edwards, Oswestry; W. C. Farnsworth, Old Fletton; W. Forrester, Middlesbrough; H. B. Gilliat, Aspatria; A. D. Gordon, Sutton, Surrey; A. L. Grimshaw, Atherton; C. F. Gurney, Newcastle-on-Tyne; G. E. Hack, Kiveon Park; F. Hatcher, Neath; S. Hatfield, Sheffield; T. Haworth, Whitehaven; R. S. Hearn, Bury St. Edmunds; S. B. Hodgson, Kensington, W.; A. Hook, Burton-on-Trent; A. Hotson, Mansfield; S. Howard, Carlisle; J. Howarth, Sheffield; C. G. Howell, Streatham, S.W.; A. Ireland, Manor Park; E. T. Jones, Llandinam; J. A. Jones, Carnarvon; W. H. Kirsopp-Reed, Newcastle-on-Tyne; G. S. Knights, Birmingham; W. J. Laker,* Wandsworth Common, S.W.; H. Lamprell, Highbury Park, N.; S. B. La Trobe, Bristol; D. M. Lawrance, Highgate, N.; S. A. Lister, Leytonstone, N.E.; W. W. Lockwood, Huddersfield; W. A. McMullen, Golder's Green, N.W.; J. McNicol, Stockton-on-Tees; H. B. Mayhew, Kempston; G. W. H. Merry, Boston Spa; J. Millar, Clapham, S.W.; J. H. Neale, Birmingham; A. L. Nightingale, Wimbledon; H. G. Nunn, Ipswich; H. T. Owen, Carnarvon; B. Park, Cockermouth; F. Parsons, Highbury-place, N.; A. S. Patten, Stanford Dingley; F. C. Payne, Neath; W. A. Peake, North Finchley, N.; A. Pikesley, St. Albans; C. S. Pinkham, Swansea; G. Poole, Liverpool; T. J. Price, Porth; J. M. Rayden, Campden Hill, W.; E. J. Rees, Neath; H. W. Richards, Llanfihangel-Talyllyn; R. H. Riley, Blackburn; E. D. Robertson, Cleator Moor; F. W. Ross, Canonbury, N.; E. T. Rossiter, Westminster, S.W.; S. W. Sherwin, Bedford-row, W.C.; J. N. Singleton, Whitehaven; W. D. Smith, Leytonstone, N.E.; L. J. Spencer, Clapham Common, S.W.; C. H. Stephens, Plympton; G. S. N. Stone, Eltham; A. G. Symes,¶† South Woodford; C. V. Symonds, Cardiff; J. H. Talbot, Birmingham; L. Z. Talmadge, Balham, S.W.; J. Thomas, Llanybyther; F. L. Thompson, Strand, W.C.; L. J. Thompson, Kidderminster; L. C. Turner, Stockport; J. T. Walters, Oadby; E. Whitby, Gloucester; A. Wild, Hyde; E. H. Wilkins, Whitby; E. E. Williams, Stourbridge; T. V. Williams, Clydach; W. E. Wilson, Grimsby; and P. J. Wood, Stroud Green, N.

* Building Prize (bracketed). † Draper Prize. ¶ Penfold Silver Medal.

IRISH CANDIDATES.

Messrs. J. A. Dickson, 19 Bridge-street, Banbridge, Co. Down; and P. J. Ward, Farney, Glen-road, Belfast.

The following candidates have passed in the Final Examination:—

Messrs. C. H. Alderson, Amersham; H. W. Allison, Carlisle; H. E. Allpress, Eel Brook Common, S.W.; B. Appleyard, Coventry; G. Back, Cavendish-square, W.; F. E. V. Bance, Ealing; H. T. S. Barker, Ealing; P. A. Benn, Lichfield; W. Benner, West Bridgford; E. J. Besent, Salisbury; H. E. Booth, Brecon; A. Bowen, Edgbaston; P. J. Bowling, Colchester; C. L. [illegible] W. [illegible] A. L. Burch, Wymondham; F. W. Chadwick, Grange-over-Sands; A. Chapman, Coventry; H. J. Chapman, Oxford; F. H. Clarke,¶ Southport; W. T. Clarke, Liverpool; F. W. Cooper, Clapham Common, S.W.; J. Costello, Middlesbrough; G. W. Cover, Derby; F. T. Cox, Port Talbot; H. J. Cutmore, Brixton, S.W.; E. V. Dartnall, Leytonstone; J. S. Davies, Bridgend; F. R. E. Davis, Barnes, S.W.; W. W. Davis, Clapham Park, S.W.; S. L. Day, Finchley, N.; A. S. Eamer, Redhill; F. S. Evans, Westminster; H. S. Fleming, Westminster; W. V. Foot, Bury St. Edmunds; R. W. Fox, Lancaster Gate, W.; J. H. Gask, Bolton; C. M. Glover, Olton; G. F. Grey, Oxton; C. A. Griffiths, Swansea; E. R. Griffiths, Sketty; F. G. Gurney, Dartmouth Park, N.W.; J. B. Hammond, Doncaster; G. N. Hannam, Wandsworth Common, S.W.; H. Haycock, Great Glen; J. D. Hewetson, Winchester; S. N. Hill, Enfield; J. E. Hillyer, Tottenham; C. H. Hirst, Fulwood; H. M. Hodson, Bromborough; E. R. Hopwood, Stockport; G. W. Hughes, Walsall; G. T. Ingham, Radcliffe; W. A. James, Knowle; S. W. Jones, Swansea; S. H. G. Kent, Finsbury-square, E.C.; N. F. Kirkwood, Blundellsands; B. Lake, Boreham Wood; L. Lanham, Oxford; R. B. Ling, Clapham Common, S.W.; A. D. O. Mackinnon, Cheltenham; R. T. Mallett, Plumstead, S.E.; A. H. Marns, Burdett-road, E.; C. Mathew, West Norwood, S.E.; W. N. Moody,*† Eastbourne; H. L. Morris, Brixton Hill, S.W.; E. B. Neville, Crouch End, N.; C. E. S. Newman, Frome; J. Normanton, Kettering; T. B. Owen, Salisbury; S. T. Puzey, Philbeach Gardens, S.W.; H. V. A. Ritchie, Stretton; G. I. Robinson, Clitheroe; B. Roderick, Aberdare; H. R. Sayer, Hartley Wintney; G. W. F. Sexton†, Brondesbury Park, N.W.; F. C. Sheldon, Macclesfield; H. T. Simpson, Blackburn; R. E. Skinner, Redhill; A. C. Soar, Cheam; A. C. Spicer, Westcliff-on-Sea; D. J. Stephen, Mollington; J. W. Stretton, Strand, W.C.; W. Strickland, Hungerford; A. B. Taylor, Purley; F. D. Taylor, Thames Ditton; T. Thompson, junr., Methley; D. G. R. Teddy, Exeter; S. R. Titchmarsh, Lee, S.E.; W. M. Trinder, Teddington; O. Tyrrell, Hammersmith, W.; E. A. Wales, Doncaster; H. B. Ward, West Kirby; A. J. Watson, Newcastle-on-Tyne; S. C. Watt, Highbury, N.; S. C. White, Scarborough; T. W. Whitfield, Salisbury; S. M. Wilkes, Wakefield; E. Woolf, Hanover-square, W.; A. V. Wright, Batley; S. W. Wright, Great Yarmouth; and T. S. Wynne, Shrewsbury.

Galsworthy Prize. ¶ Gold Medal (bracketed). † Crawter Prize.

IRISH CANDIDATES.

Messrs. P. Coughlan, Mitchelstown, and H. M. Wilson, Belfast.

The following candidates have passed in the Direct Fellowship Division:—

Messrs. G. Arnall, St. John's-hill, S.W.; A. D. Cheverton, Southampton; C. F. Elias, Liverpool; B. E. Evans, Llanelly; D. J. Jones, Port Talbot; P. A. Lewis, Morriston; H. Oxley, Norbury, S.W.; T. T. Rees, Liverpool; A. C. Rogers, Plaistow, E.; J. Scott, Newcastle-upon-Tyne; F. W. Showers, Maidenhead; A. Stone, Walsall; H. Tinker, Huddersfield.

SCOTTISH EXAMINATIONS.

The following candidates have been successful in passing in the Intermediate Division:—

Messrs. J. C. Pinkerton, Glasgow, and J. Rattray, Perth (student candidates); T. Adam, Elgin; R. I. Barr,* Bridge of Weir; W. M. Bishop, Motherwell; R. P. Campbell, Musselburgh; W. N. Clark, Dundee; J. C. I. Colquhoun, Paisley; J. W. Dunn, Glasgow; J. Gray, Bonnyrigg; R. McCall, Dundee; J. McFarquhar, Glasgow; D. McLachlan, Glasgow; P. M.

Maclean, Glasgow; A. Sutherland, Glasgow; and A. Watt, Elgin (non-student candidates).

Scottish Prize.

The following candidates have passed in the Final Division:—

Messrs. W. B. Burnett, Dalkeith; A. Cochran, Linwood; J. Donaldson, West Kilbride; H. M. Grant, Perth; W. R. Johnston, Edinburgh; P. Kerr, Brookfield; T. Leith, Perth; J. Ramsay, Falkirk; T. W. Robb, Glasgow; J. D. Smith, Airdrie; E. L. Williamson, Dundee.

The following has passed in the Direct Fellowship Division:—

Mr. J. Watt, Aberdeen.

CORRESPONDENCE.

Ἐκ ἑνὸς οὐ πάντ' ὄψα
(*One man does not see everything*)
Euripides

BITUMEN.

To the Editor of The Surveyor

Sir,—From your report of Mr. Nandy Hoskins's paper, "Asphalt and its Application in Sanitary Work," read before the Institute of Sanitary Engineers, it is interesting to learn that Mr. Delano was very rightly recognised as an authority on asphalt, and, as Mr. Hutchinson remarked, "no one could take priority of Mr. Delano" in the discussion that followed.

The fact is apparently clear that there are, as you have kindly allowed me to state on many occasions through your columns in the past, authorities on asphalt and bitumen in this country who could have furnished the necessary information that would have enabled Colonel Crompton and his committee to publish the true and correct classification and definitions of asphalt, bitumen, petroleum pitch, &c., without seeking advice or approval from America.

Mr. Delano, I believe, has had very extensive experience both in this country and on the Continent, but I understand Colonel Crompton's committee—whose proceedings, you stated in your "Minutes of Proceedings," January 23, 1914, were "conducted in private"—did not consult or hear Mr. Delano's views on the subject.

In view of Colonel Crompton stating as far back as 1913 that it was his intention, and that of those associated with him, to confer with certain American engineers, and as a result of their united action to obtain the classification of petroleum pitch as "bitumen," I have referred to some of the writings of Mr. Delano on asphalt and bitumen to ascertain whether he was of the opinion that petroleum pitch should or should not be described as "bitumen," and Mr. Delano, I notice, distinctly states in a paper he read before the Institution of Civil Engineers that "mineral bitumen should not be confounded with the residuum of crude petroleum," and that "asphalt and bitumen are natural products."

I might also quote the opinion of Mr. D. A. Sutherland, F.I.C., F.C.S., another eminent authority on asphalt and bitumen, who states that "bitumen is a natural product, as opposed to bituminous products obtained as the result of destructive distillation or by other artificial means."

Petroleum pitch is, of course, the residuum from the distillation of petroleum oil in the same way as coal-tar pitch and other pitches are obtained by distillation, and if any one kind, such as petroleum pitch, is entitled to the term "bitumen," then the same must apply to coal-tar pitch and all others—a suggestion which is, of course, ridiculous.

The objection to the term "petroleum pitch," and the object of describing this as "bitumen" has never been explained, but I am strongly of the opinion that there is sufficient evidence to prove that bitumen has always been understood to refer to a natural product, and that petroleum pitch is not entitled to this term any more than any other form of pitch.—Yours, &c.,

A. E. H. Dunseb.

Bromley-by-Bow.
May 20, 1915.

Town Planning Institute.—The annual meeting of this body has been fixed for the afternoon of Wednesday, June 23rd.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Apropos of the statement of the chairman of the Royal Automobile Club at the recent annual meeting of that body that the names of 200 alien enemies had been removed from the list of members since the war broke out, should not this excellent example be followed by other societies, and by a certain engineering institution in particular? Is there no courage or patriotism left in the council of this institution?

* * * *

Should not the discussion on mechanical water filters which will take place at Shrewsbury this evening, under the auspices of the Royal Sanitary Institute, be of considerable interest? Is it not remarkable to observe the progress which has been made in recent years on the old types of mechanical filters, and is it not to be hoped that the discussion will tend to a definite opinion as to which is the best and most economical method to pursue?

* * * *

Why is it that in this country we have not been very successful in our concrete road building, whereas in the United States many hundreds of miles of this material have been constructed with considerable success? Is it because we are too sparing of the cement, or do we not get the right material as a matrix, or is it because we cannot keep the traffic off the face of the concrete long enough to let it set properly? Or what is the cause of failure? The American engineers appear to attach considerable importance to the provision of sufficient and reliable expansion joints; do we properly understand the proper placing of these joints?

* * * *

Do we not all sympathise with Mr. J. W. Orde, the secretary of the Royal Automobile Club, who lost his son, Lieut. H. W. J. Orde, R.N., by the sinking of the "Goliath" in the Dardanelles? Is not this death a loss, not only to him, but to the country, as Lieutenant Orde was a brave and skilful officer, who had gained the D.S.O. only a few months before his death by his distinguished bravery during the fight at Dar-es-Salaam?

* * * *

Was it not rather remarkable that the Local Government Board, and not the Institution of Civil Engineers, should have sent a circular letter to consulting engineers asking them for information as to how the war had affected their practice, and, if there was a slackness of work, in what way it could be ameliorated? Would not one have thought that the proper body to take this action would have been the great mother institution of all consulting engineers, and not a Government Department? Does the council of the institution quite realise their responsibilities to their members?

Pudloed Cement.—We are informed that the concrete water tower recently erected at Stafford has been lined with Pudloed cement with perfectly satisfactory results.

Southsea Pier to be a Military Hospital.—Portsmouth Corporation have decided to turn Southsea Pier into a temporary military hospital in response to the War Office request that the town should provide accommodation for 500 men.

Bournemouth Front Improvements.—The mayoress, Mrs. James Druitt, on Wednesday declared open to the public the new shelters, cliff paths, and terraces which have recently been constructed by the Bournemouth Corporation at a cost of several thousand pounds on the sea front at the Boscombe end of the Undercliff-drive and Marine-parade.

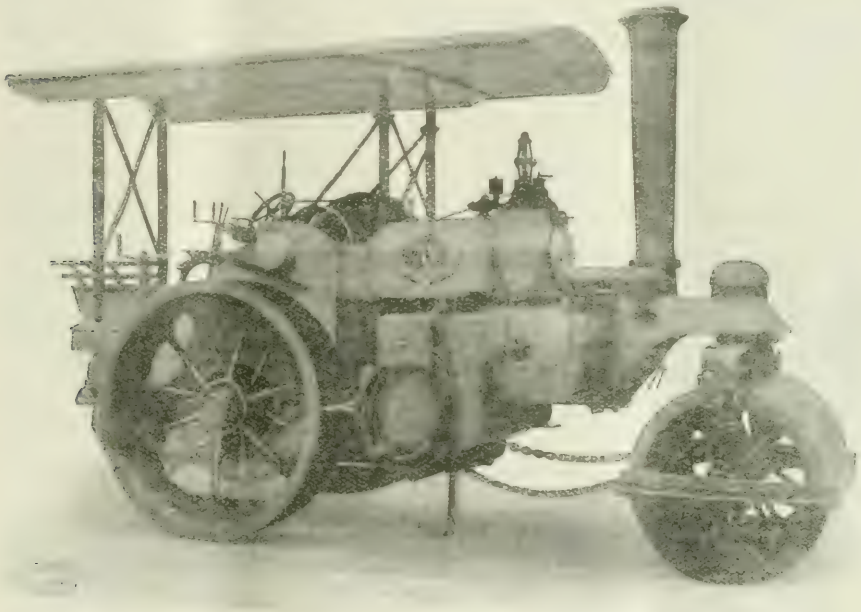
Loch Lomond Road Improvement.—The Western District Committee of the County Council of Dumbarton have completed the work of improving the second section of Loch Lomond-road. The carriageway has been increased from a minimum width of 11 ft. 6 in. to 16 ft. Formerly the road was carried over the Douglas Water on a bridge 48 ft. 6 in. span and 12 ft. wide. Now the bridge is 20 ft. wide, and the addition is built on a curve of 180 ft. radius, thereby doing away with the sharp bends. The cost of the undertaking has been borne by the county authorities and the National Road Development Trustees.

"MARSHALL" CONVERTIBLE ROLLER-TRACTOR.

We have pleasure in giving an illustration and description of a successful type of roller-tractor which is manufactured by Messrs. Marshall, Sons & Co., Limited, Gainsborough, Lincs. This convertible engine is built in accordance with well-established modern practice, and, as the result of actual working experience extending over two or three years, it is claimed that the engine is a thoroughly practical type, and quite free from those inherent defects which often militate against the convertible roller-tractor in one or even both of its capacities.

As a roller, its weight (empty) can be arranged to be 6 or 8 tons, according to the weight of the road rollers with which it is fitted; and as a steam tractor it makes a haulage engine economical in operation and well suited for the transport of road materials.

The motion mechanism is erected on a well-proportioned boiler of the locomotive-multitubular type. The firebox of the boiler is an exclusive "Marshall" patent and has a [illegible] crown plate. The peculiar shape of this crown considerably retards the formation of scale, and the improved circulation of the water [illegible] the [illegible] and [illegible] is claimed to be always maintained at its maximum efficiency, even at times when the use of dirty feed water is unavoidable.



The power transmission is arranged on the three-shaft principle, and a four-pinion differential or compensating gear is usually supplied, as thereby the engine steering is much improved, the main axle relieved of stresses, and the wear on the road wheels, or rollers, is considerably reduced. The transmission gear has machine-cut teeth, except in the last motion, and runs in an oil bath.

The cylinder casting, either simple or compound type, is erected on a pressed steel mounting riveted to the boiler barrel. The piston, crosshead, connecting rod, link motion, crankshaft, and crankshaft-bearing details are conveniently and compactly devised, and a positive-action oil pump of the "Manzel" pattern is fitted for lubricating the cylinder interior and slide valve faces. A geared-down feed pump, automatic feed-water injector and water lifter are fitted to requirements, and ample accommodation is provided for storage of water and fuel.

When the engine is destined for considerable employment on haulage the makers fit a winding drum and a simple system of spring mountings, but this equipment is optional on a convertible roller, except in cases where, when converted to a hauling engine, it is worked as a steam tractor under the Heavy Motor Car Order, and in that case spring mountings are a legal stipulation.

The arrangements for quick conversion are carefully designed. On reference to our illustration it will be observed that a flanged bolted joint with machined faces in contact is provided between the boiler barrel and smoke-box. The latter part, with the fork and front rollers, can be readily removed, and replaced by a smoke-box, undergear and road wheels of the usual tractor type. The hind or driving wheels are also easily exchanged for road wheels, thus providing, with a few hours' work, an exceptionally serviceable engine which will be equally efficient for road rolling or haulage.

The haulage of road materials by steam tractors has been proved by many road authorities to be a far more economical method than horse haulage, as may be witnessed by the large number of steam tractors now employed by councils and contractors. We have recently seen some convincing statistics compiled from daily records by a surveyor which show that an enterprising Midlands urban council saved over £275 [illegible] was used by them, as compared with the combined cost of horse haulages and inevitable steam roller hire charges, previously incurred. To cite a typical case of the reliability of the roller-tractor used in the latter capacity, one of these engines was employed hauling for a large road repairing contract. During a period of seven months, 7,000 tons of granite were hauled, involving an aggregate of 7,500 miles travelled. The work, which was that of a give-and-take nature, and at times over heavy roads, was accomplished without the disclosure of a single mechanical fault, a fact which speaks well for the sterling qualities of the materials and the workmanship of the engine.

The convertible appliances are obtainable at a moderate cost, and, given that the local conditions demand a fair proportion of road rolling and haulage work, an engine which can, at short notice, be operated either as a roller or a tractor is quite an economical proposition, and well worth consideration for a near future when shortage of manual labour is certain to be in evidence, and labour-saving appliances will be a marked necessity.

The Littleton Reservoirs.—The Metropolitan Water Board have accepted for the construction of a portion of the Littleton reservoirs a tender amounting to £673,212.

Law Notes.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Editor," at the office of THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." Where necessary, copies of local Acts or documents referred to should be enclosed.* All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—*i.e.*, without re-drawing or amendment. *Unless these conditions are complied with we cannot undertake to reply to queries.*

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X. combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

HIGHWAY: ADJOINING OWNER'S RIGHT OF ACCESS. "ANXIOUS" writes: In the laying of a sewer in a rural district it was found necessary, if a proper gradient was to be obtained, to keep a length of about 66 yds. of it above ground, where the land dipped. Ordinary sanitary pipes have been used and encased in concrete, and from the top of these to the lowest part of the dip is 1 ft. 8 in. The sewer has been laid on the grass border of an occupation lane repairable by the local authority. The owner A of field adjoining this length of sewer has threatened proceedings if the portion of sewer above ground is not removed, stating that he cannot obtain access to the centre of his field from the highway. There is no gate on this side of the field at present, and no probability of the ground being developed as building land, and the sewer is underground at both ends of his frontage. There are no houses on either side of this portion of lane, which ends at a field-gate about 30 yds. further on. Your opinion is desired on the following: (1) Can owner A demand access to his field at any point from the highway? (2) Could he, or anyone, object to the highway being raised in this dip to the height of concrete, and could the local authority do this without obtaining sanction of Local Government Board?

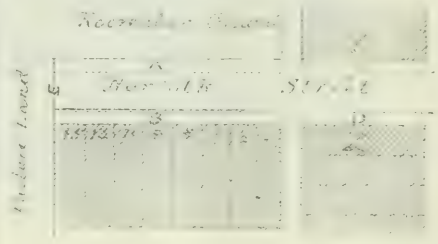
1 The general rule of law is that the owner of land adjoining a highway has a right of access to the highway from any part of his land adjoining the way, and this right of access extends along the whole line of the boundary between the highway and the adjoining land. It was held, however, in *Rowbotham v. Wilson Local Board* (1877), 7 Ch.D. 328, that the power conferred upon a local authority by sec. 16 of the Public Health Act, 1875, to carry any sewer "through, across, or under" any lands within its district, authorised the construction of a sewer on private land partly above ground, subject to the payment of compensation under sec. 308. It appears, therefore, that in the present case the right of access of the owner A has been technically infringed, and that he is entitled to some compensation under sec. 308. (2) Sec. 149 of the Public Health Act, 1875, which confers the power to raise or lower the soil of a street, applies only to urban authorities, and the section is not applied to rural districts by sec. 25 of the Local Government Act, 1894. The level of the highway could not be raised therefore in the absence of urban powers.

RIGHT TO LIGHT.—"Light and Air" writes: I enclose plan showing adjoining properties A and B in a yard or court. The owner of property B wishes to

raise his wall adjoining A's property from point C to D, as shown on plan and section. Would you please give me your opinion whether B will be within his legal rights in doing so?

It is assumed that A has acquired a prescriptive right to light through the window shown on the drawing by the actual enjoyment of the access of the light without interruption for twenty years. This being so, the easement does not necessarily consist in a right to have a continuance of all the light which has hitherto come to the window. The test whether any interference is actionable is not whether the diminution is enough materially to lessen the amount of light previously enjoyed, nor is it entirely a question of how much light is left, without regard to what there was before, but whether the diminution (that is, the difference between the light before and the light after the obstruction) is such as really makes the building to a sensible degree less fit than it was before for the purposes of business or occupation according to the ordinary requirements of mankind (*Colls v. Home and Colonial Stores, Limited*, 1904, A.C., 179). The 45 deg. rule may be a rough test in the absence of any other mode of arriving at a conclusion, but it rests upon no accepted rule of law or evidence.

PRIVATE STREET WORKS APPORTIONMENT. "Ipso Jure" writes: Private street works have been carried out in a street named Norfolk-street under the powers conferred by sec. 150, Public Health Act, 1875. Before the notices to pave, &c., were served on the frontagers by the council, certain works had been carried out as follows: Footway B was flagged 6 ft. wide, kerbed with 12-in. by 8-in. kerbs, and channelled with 12-in. by 6-in. channels. The channels are indicated by thick black line in front of footway B, shown on drawing. Footways C and D were flagged 6 ft. wide, and kerbed with kerbs 12 in. by 8 in. No channels were laid down. Footway A did not exist, nothing having been done by the council as frontagers to the recreation ground. The frontagers did not comply with the terms of the notices served upon them; consequently the council carried out the works by contract, the lowest tender being accepted. The works carried out under the contract were as follows: Footway A was kerbed with 12-in. by 8-in. kerbs, and flagged 6 ft. wide. The whole of the carriageway between the kerbs on each side of the street was paved with the exception of the channelling in front of footway B. This channelling was in good condition, and fit to remain down;



it was therefore allowed to remain. As before stated, all other channels were paved. The cost of the works have been apportioned as follows: The cost of the whole of the flagging and kerbing carried out on footway A has been charged to the council as frontager of the recreation ground. Although it is intended in the future to continue Norfolk-street in a westerly direction, the frontage E has been apportioned on the landowner; the frontage A, or the recreation ground, has been apportioned on the council, the frontagers of [illegible] tioned on the respective owners, all apportioned according to the frontage abutting or adjoining on the street. No notice was taken of the channelling which was laid down before the works carried out under the contract were commenced. In front of the footway B it was simply left there, where it had been fixed at the expense of the frontagers of 1 to 15 (odd numbers) Norfolk-street; it was not taken into account in any way. These frontagers claim that they should have some allowance for the channelling which they laid down. Will you please say: (1) Is the apportionment made a good one legally? (2) Are there any cases decided on all fours with it? If so, will you please quote them?

1 In [illegible] (1880), 5 C.P.D., 248, an urban authority acting under sec. 150 repaired the footway on the south side of a street, and apportioned the whole cost on the premises on the

The Surveyor
And Municipal and County Engineer.

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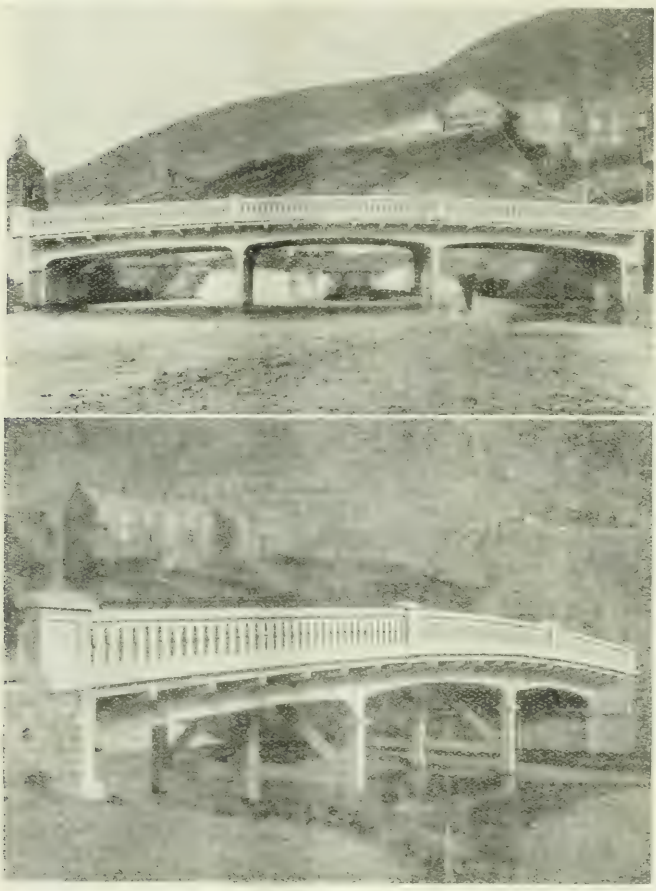
[illegible] side of [illegible]. It was held that the appointment was [illegible] on the ground that the [illegible] were [illegible] the [illegible] on the east [illegible] Princes Road [illegible] dealing [illegible] and that [illegible] required repair, and that the [illegible] were [illegible] mentioned as [illegible] public [illegible] which [illegible] were [illegible] repair. A [illegible] the appointment now [illegible] [illegible] [illegible]

VELINDRE BRIDGE, ABERAVON.

By James Roderick,
Borough Engineer of Aberavon

The Velindre Bridge was erected to connect two parts of the district separated by the river Avon, which are being very rapidly developed. Until the bridge was constructed Velindre was practically isolated, being bounded by the railway on the one side and the river on the other, so that until traffic facilities were provided building operations could not be proceeded with. The new bridge was designed on the Mouchel-Hennebique system of ferro-concrete by the writer, for whom working drawings were prepared by Messrs. L. G. Mouchel & Partners, of Westminster. As the Margam Urban District Council contributed to the cost of the work, the plans were submitted to their surveyor, Mr. Cox, for approval. The structure, which was completed towards the end of last year, crosses the river Avon a short distance north of the town, at the toe of the weir, where the river is 108 ft. wide. It is divided into three spans of 36 ft., and has a width between parapets of 36 ft., providing for a 24-ft. roadway and two 6-ft. footways.



Views of Velindre Bridge.

Each span is supported on piers composed of three 16-in. by 16-in. vertical columns, braced together and founded on splayed ferro-concrete bases on a rock foundation. Each span has three 36-in. by 9-in. main beams, with 15-in. by 7-in. secondary beams spaced 5 ft. apart to support the road decking, which is 4 in. thick. The secondary beams project beyond the main beams, thus forming cantilevers to carry the footpaths. Over the road decking a 9-in. layer of granite metalling was laid, well consolidated with a 10-ton steam roller. The pathways are covered with a 1-in. layer of rock asphalt, with a 10-in. by 6-in. Pennant stone kerb. The parapets are of the open type, and were made in situ in cement concrete, covered with a moulded concrete coping.

On September 22nd last the bridge was officially tested under the direction of the writer, acting on behalf of the Aberavon Corporation, the test load consisting of a 15-ton steam roller. For the measurement of deflection three sensitive deflectometers were adjusted beneath the centre span, one on the north side marked No. 1, one in the centre marked No. 2, and one on the south side marked No. 3.

The first test was made over No. 2 instrument at the centre, when the deflectometers read as follows: No. 1, $\frac{1}{64}$in.; No. 2, $\frac{2}{64}$in.; and No. 3, $\frac{1}{64}$in.

The second test was made over instrument No. 1, when the deflectometers read No. 1, $\frac{1}{64}$in.; No. 2, $\frac{1}{64}$in.; and No. 3, nil.

The third test was made over instrument No. 3, when the deflections registered were as follows: No. 1, nil; No. 2, $\frac{2}{64}$in.; and No. 3, $\frac{1}{64}$in. When the load was removed the construction returned to its original form.

As the contract conditions permitted a deflection of $\frac{1}{4}$in. the tests were considered to be highly satisfactory, and everyone present was well satisfied with the results.

It is interesting to note that this is the second ferro-concrete bridge spanning the river Avon, as the Canister Bridge, described on p. 139, Vol. II., of *Ferro-Concrete* [from which this article is reproduced], was constructed for the Aberavon Corporation in 1910. The latter structure has been exposed to very heavy floods for some few years, and its capacity for withstanding the severe strains involved have surpassed all expectation.

Coroner's Jury Recommend Whitened Kerbs. At [illegible] borough jury who on Saturday inquired into the death of a taxicab driver, killed in a collision with a motor car on the sea front after dark, suggested that all corners and kerbs of roads should be whitened.

Faculty of Surveyors of Scotland. [illegible] been received from the Secretary to the Treasury that that in future the passing of the examinations of the Faculty of Surveyors of Scotland shall be regarded equally with the passing of the examinations of the Surveyors' Institution as affording prima facie evidence of suitability for appointment to permanent positions under the Government.

Hull Corporation Tramways. The Hull City accountant on Wednesday presented the accounts of the tramways undertaking for the financial year ended March 31st last, showing income £163,030 5s. 7½d., working expenses £110,593 18s. 8½d., mobilised employees £3,707 19s. 2d., gross profit £48,728 7s. 9d. The interest, loan charges, income-tax, &c., totalled £34,153 15s. 10d., giving a nett profit of £14,574 11s. 11d. £10,000 of the profits has been put to the relief of the current year's rates, and a balance of £6,076 2s. carried to the reserve fund, which now stands at £146,196 10s. 4d. The sinking fund accumulations total £163,483 19s. 9d. The nett expenditure during the year was £28,058

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, 88 Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

Two weeks are given for the following questions.

479. Reservoir Dam. Give sketch and description of an earth embankment with clay puddle across a mountain brook 12 ft. wide, rising from each side of brook 1 in 2, the embankment to be 12 ft. high in the river bed. (E. P. M., *Tawgai*.)

480. Sewer Survey. It is required to survey the course of an old brick sewer, 3 ft. diameter, which runs for 1,000 yds. in a very irregular line on a badly-planned design. There are no available records. How can this be done, and what instruments should be used? (W. S. W., *Chesterfield*.)

482. Water Towers. What are the objects of water towers, and how did they originate? In their stead write a short essay dealing with the subject. (C. Reed, *Redruth*.)

483. Bridge Construction.—How are the lengths of the four wing walls of a bridge and the horizontal angle between the bridge and each wall determined? (Theo.)

484. Hydrostatics. A square sluice opening, 3 ft. by 3 ft., is formed in the vertical face of a dam, and the upper edge of the opening is 6 ft. below water. Calculate the hydrostatic pressure upon the square area, and find the exact position of the centre of pressure. (A.M.I.C.E.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

474. Roof Truss. When one end of a steel roof truss is supported on roller bearings, which move, as made to accommodate the movement, and to prevent damage to the slates and timbers? How would any movement in the truss affect the roof covering? How much in a 50-ft. span roof does it move? ("T-Square.")

It is not usual to make any arrangements to counteract the movements and prevent damage to the roof covering and timbers when one end of the truss is provided with roller bearings. The movement in the truss is so small that the movement in each individual slate or other covering is nominal, the slates sliding over one another if any movement is necessary. The only case in which allowance is made for expansion and contraction is when the covering is laid in large continuous sheets. The most familiar examples of this are rolls, welts, drips, &c., in lead, copper and zinc coverings. In the case of roof timbers the timbers tend to expand in the same direction as the truss, and therefore minimise the effects; also timber is slightly elastic in its fibres, and the fastenings give sufficiently to prevent damage to the timbers. It should be noted that the theoretical movement due to expansion only partly takes place, as the rigidity of the roof timbers, &c., is sufficient to cause higher stresses in the members of the truss rather than to allow the movement to take place to its full extent. The coefficient of expansion for iron and steel is about ·0000068, and for deal about ·0000028 of its length for each degree of temperature Fahrenheit. The relative expansion between timber and iron per degree of Fahrenheit is thus ·0000045 of its length. Assume that the extreme range of temperature is from 0 deg. Fahr. to 130 deg. Fahr. This is a wide range, and not likely to be realised, as in almost all cases the roof truss is not directly exposed to the sun and frost. In the case of a 50-ft. truss, under the above conditions, the maximum extension of the tie-bar will be $50\times12\times\cdot0000068\times130 = \cdot5304$ in. In the case of the rafters (principal), 45 deg. pitch length about 30 ft., it will be $35\times12\times\cdot0000068\times130 = \cdot37128$ in., while the relative expansion between rafter and purlin (say rafter will be $35\cdot12\cdot\cdot0000045 \times 130 = 24\cdot7$ in. The amount of expansion is seen to be very small, and explains why it is not usual to provide for expansion in trusses of less than 50-ft. span, the necessary movement in such cases being met by the truss rising slightly at the centre. (A.M.I.C.E.)

481. Testing Materials. Mention some tests by which we can estimate or measure the ductility of metals, and some of the reasons which make it important to obtain a test of this property. (A.M.I.C.E.)

The following additional reply to this question has been received since our last issue:—

Ductility is that property of a metal which allows of its being drawn out by tension, a reduction of sectional area accompanying this operation. During ductile extension the material suffers elastic

and plastic strains. The reverse of ductility is brittleness. Mild steel is ductile, while cast iron is brittle. If a ductile metal, such as mild steel, be subjected to a gradually increasing tensile stress, it is found that the resulting strains are proportional to the stresses, or stress = strain × constant, where the constant is the modulus of elasticity; so that if we plot these stresses with their corresponding strains we obtain a straight line OA in diagram, neglecting permanent or plastic strains less than ·00001. When the stress is increased and reaches a certain point, it is noticed that strain increases at a faster rate than the stress, and when this is so the elastic limit has been reached, and plastic strains begin. At a stress a little higher than the elastic limit, the metal undergoes a sudden comparatively large elongation, and we know that the yield-point has been reached. In the diagram B marks the yield-point. After the yield-point is reached the ductile extensions take place, the strains increasing faster than the stresses, as indicated by the curve CD. Strains now produced do not develop as do the strains below the elastic limit. The greater part of the strain occurs quickly, but is followed without increase of load by a small additional extension. During these ductile elongations the area of the cross-section is reduced fairly uniformly along the entire length of the bar, the volume of the test-piece being constant. It should be carefully noticed that when the stresses are calculated for such a diagram as Fig. 1, the load on the test-piece should be divided by the original cross-sectional area of the bar. If

this is done, and the stresses and strains plotted, it is noticed that the stress-strain curve begins to dip after the point D, and the bar fails at a load less than the maximum. However, this is not really the case, for the stress was calculated on the original sectional area of the material, and not on the actual area of section when failure occurred. Between the point D and the breaking-point a waist is formed in the specimen test-piece, and a local ductile extension takes place. Previous to the maximum load the elongations and accompanying contractions in sectional areas appear to be uniform throughout the whole length of the bar. Suppose our bar were 9 in. long, and that the bar were divided into nine equal parts of 1 in. each in length. From our observations we know that percentage elongation of each division would be about equal up to the point D of maximum load. Subsequently, a waist would be formed, say, near the middle division, and at fracture the percentage elongation of the two or three middle divisions would prove much higher than that of the remainder. It is obvious, then, when measuring the percentage elongation which indicates the ductility of a bar, care should be taken to note over what length of bar the observation is taken. Extensions are often measured on a length of 8 in. The geometrical proportions of the test-piece also play an important part in the determination of comparisons between ductilities of specimens. For instance, if on a round bar 1 in. in diameter, the local contraction of section and extension of length is mainly on, say, 2 in., or one-quarter of the whole length, if the bar were 8 in. long, in a bar of ½-in. diameter, the local elongation and contraction would be restricted to 1 in., or one-eighth the length. The local contraction on the thicker bar will consequently add more to the total percentage elongation on the 8-in., since the 2-in. length undergoing the local ductile extensions is a greater proportion of the whole. Prof. Unwin has suggested that a possible method of comparing ductilities of two bars of unequal areas of cross-section is to make the length over which the elongation is measured proportional to the diameter of the specimen, or the square root of the area if the test-piece be not round. However, the increase in the cost of preparing specimens for testing forbids the adoption of this method of making all specimens geometrically similar. Morley, in "Strength of Materials," gives the following method of effecting approximate comparison of ductilities of test-pieces as measured by the ultimate elongation:—

Let e = total extension
l = length gauged for observations

Now e is made up of the general extension proportional to l, say bl (where b is constant), and a local extension a independent of l, which occurs when the waist is formed.

Then

$$e = a + bl$$

and percentage elongation $= 100\frac{e}{l} = 100\left(\frac{a}{l} + b\right)$

a quantity which, for a given sectional area, decreases and approaches $100b$, as l is increased.

The local extension a is practically proportional to the square root of the area of section A, say

$$a = c\sqrt{A}$$

and percentage elongation $= 100\left(\frac{c\sqrt{A}}{l} + b\right)$

a quantity which increases as A increases and decreases as l increases. c and b are constants for a given quality of material. If the percentage extensions of two pieces of the same material, but of different dimensions in length and cross-section, or the extensions of two considerably different lengths on the same piece, are known, then the constants a and b, or c and b can be found from the above formula. Having determined the constants for a material we could approximately the elongation of another piece of other dimensions of the same material by applying the formula. When designing a structure we proportion the sectional areas of the different members so that no member is strained beyond the elastic limit of the material employed, and, in fact, our safe stress is often one-half the stress at the elastic limit. The elastic limit of a test piece can, however, be increased by treatment, but generally at the expense of the ductility of the material. Now lack of ductility [illegible] fail under vibration or shock; failure under dead loads with such a material may take place without warning. Ductile materials, on the other hand, absorb shock to a large extent, and impending failure is often evident; thus excessive deflection in a rolled steel joist would denote that the material may be strained beyond the elastic limit. Again, local ductile yielding in the members of a complex structure will relieve high local stress, thereby preventing a member accidentally stressed beyond the elastic limit from reaching the breaking stress such as might occur if a less plastic material were used. The usual indications of the ductility of a material are the percentages of elongation over a stated length and the contraction of sectional area over the original area at fracture under tension. Ductility is as important as strength, although we usually only endeavour to design structures so that the safe stress, which is generally one-half the stress at the elastic limit, is not exceeded. (M. T. R., *Rhyl.*)

Notes.

Prof. Alexander, of University College, Cork, writes:—

In your "Students' Section," p. 627, of May 14th, I notice two answers to a question on levelling. It seems to me that there is a deal of unnecessary confusion, and one cannot but think that this is entirely due to booking according to the old "rise and fall" method. I append the same readings entered according to the rulings in the books that we use here. [I may say I get these printed locally, and they sell at 6d. each, for a book of thirty double pages, well bound. It is better to have small books rather than perhaps lose a book containing many weeks' valuable work.] I have the same book for the level and for the tacheometer, so that the page here headed "Remarks" is really subdivided into five other columns. The greatest advantage that this "collimation" method possesses is in setting out.

Form of Level Book.

Reading.	Height of Inst.	Elevation.	Distance	Remarks.
3·25	31·55	28·30		O.B.M.
5·00	31·55	26·55		Change
4·75	31·30	26·55		
6·00	31·30	25·30		Change
4·95	30·25	25·30		
6·20	30·25	24·05		

It needs no explanation to see how simple setting sight rails is, where the invert levels of the sewer or channel are written in the first blank column, the rail levels in the fourth, and the necessary readings in the second. The "rise and fall" method is absurdly clumsy and confusing, and it is truly amazing to think that anyone in practical work should still employ it.

Locomotives and Heavy Motor Traffic.—The Departmental Committee recently appointed by the President of the Local Government Board to consider the law and regulations relating to the construction and use of road locomotives and heavy motor cars in Great Britain have begun to take evidence. The committee have examined witnesses representing the Local Government Board, the Secretary for Scotland's department, the County Councils Association, the County Surveyors' Society, and the Institution of Municipal and County Engineers.

Pwllheli Improvement Scheme.—Pwllheli Town Council six months ago started a big parade extension scheme, for which Government grants were made and sanction to loan was received from the Local Government Board. The town clerk reported at the council meeting on Tuesday that the board have now intimated that the loan cannot proceed without further sanction, and that a special inspection was made on the works. A member observed that, if the work was suspended now, damage amounting to thousands of pounds might result from the ravages of the sea in the winter. It was resolved to impress this fact on the Local Government Board.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Crompton U.D.C. (May 18th. Mr. W. O. E. Meade-King.)—£400 for extension of [illegible] parish and the Lees Crompton. Mr. E. H. Tullock, C.E., of Stalybridge, explained that [illegible] the present [illegible] at Newbey [illegible] could not be drained to Newbey, and which covered [illegible] The district [illegible] Council had applied to the Local Government Board for sanction to borrow the money, but they could not have sanction for the loan at present, and the Manchester Corporation had [illegible] ing them, and it was desirable that they should have power to start the work as quickly as possible when circumstances permitted the loan being sanctioned. [illegible] and also that the board would recommend the Public Works Loan Commissioners to advance the money. The works were constructed some twenty years ago, before his connection with the council, but he had drawn up particulars, so far as they were ascertainable [illegible]

APPLICATIONS FOR LOANS.

Cheshire C.C. £[illegible] for an isolation hospital at Parkgate and Neston.

Gellygaer U.D.C. £1,500 for [illegible] purposes.

Lancashire Asylum Board.—£27,500 for the new asylum at Whittingham Asylum.

Llandudno U.D.C.—£2,646 for the purposes of electric lighting.

Raunds U.D.C. £1,500 for laying out a [illegible]

LOANS SANCTIONED.

Brierfield U.D.C. £[illegible] for [illegible] and arched culvert at the [illegible] Mills.

Cleethorpes U.D.C. £11,000 for [illegible] sewerage scheme.

East and West Ardsley R.D.C.—£2,000 for works of water supply.

Hartismere R.D.C.—£128 for sinking a well.

Hawarden R.D.C. £380 for the purchase of land for a housing scheme.

Hemel Hempstead R.D.C. £600 for [illegible] machinery.

Paignton U.D.C.—£3,037 for an isolation hospital.

Penistone U.D.C.—£880 for water mains.

Rugby U.D.C. £1,750 for housing, £3,350 for playing fields and £1,400 for cemetery extension.

Scarborough T.C.—£1,450 for a shelter on the fore shore.

FORTHCOMING INQUIRIES.

JUNE.	£
1. **Barrow.** For the purposes of a public park (Mr. W. O. E. Meade-King) ...	1,500
1.—**Branston.** For works of sewage disposal (Mr. A. W. Brightmore)	3,800
2.—**Beverley.** For works of sewage disposal (Mr. H. Shelford Bidwell)	—
2. **Romford.** For works of sewerage (Mr. E. H. Tullock)	540
2. **Skipton.** For works of water supply (Mr. W. O. E. Meade-King)	625
2.—**Wakefield.** For the purposes of the electricity undertaking (Mr. A. W. Brightmore)	
3. **Bromley.** For the purposes of road widening (Mr. E. H. Tullock)	937
3.—**Colywn Bay.** For the purposes of a reservoir and public walks (Mr. W. O. E. Meade-King)	660
3.—**Conway.** For the construction of a bridge and of a water main (Mr. W. O. E. Meade-King)	6,000
3.—**Folkestone.** For works of sewerage (Mr. P. M. Crosthwaite)	1,000
3.—**Oldham.** For works of sewage disposal (Mr. A. W. Brightmore)	485
4. **Cirencester.** For the purposes of street improvement (Mr. W. O. E. Meade-King)	1,200

SOME RECENT PUBLICATIONS.*

[illegible] H. H. Higbie. Price 8s. 6d. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited.

This book is designed as a first course in alternating-current electricity for students. The text is carefully graduated, and is confined mainly to a simple though thorough treatment of general principles, together [illegible] priate important departments of electrical engineering practice. The teaching experience of the authors has enabled them to produce a work which will be found well adapted to the needs of those for whom it has been written.

[illegible] Fleming, M.E. Price 8s. 6d. nett. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited.

Beginning with estimates of water requirements of different crops on different soils and in different localities, the author proceeds to consider wells and well sinking, pumps and pumping machinery, prime movers, windmill irrigation, the question of cost, and the central station plant. Although the practice of irrigation is, fortunately, not a necessity in this country as it is over a large portion of the American Continent, much of the information contained in this volume will be of interest to British engineers.

SURVEYING MANUAL. By H. C. Ives. Price 9s. 6d. nett. London: Chapman & Hall, Limited.

This little manual (published in New York by Messrs. John Wiley & Sons) is intended for the use of first-year students in surveying, and especially for non-civil engineering students. A very wide range is [illegible] The [illegible] that the description of each instrument or operation is followed by a problem worked out in detail; that field notes are reproduced to a large and clear scale; and that the necessary tables for ordinary work are included.

Arterial Roads in Greater London.—A meeting of the Northern Arterial Conference will be held at the Local Government Board offices to-day (Friday) at 2.30 p.m.

Holborn Council Staff and the War.—At Holborn Borough Council meeting on Wednesday evening, Alderman C. Fitzroy Doll reported that seventy-five out of the council's staff of 180 had enlisted. All the men in the council's service of military age were now either serving or had been rejected.

A Glossary of Road Terms (By H. Percy Boulnois, M.INST.C.E., St. Bride's Press, Limited, 24 Bride-lane, E.C., Price 2s. nett).—The movement towards standardising the principal roads throughout the United Kingdom has rendered it necessary to correlate the nomenclature of road terms in use in different districts, and Mr. Boulnois has compiled a glossary with the hope that it may form a basis for such a correlation. [illegible] *Engineering Supplement*.

Sewage Disposal at Skegness.—The annual report of Mr. R. H. [illegible] engineer and surveyor to the Skegness, Lincs, Urban District Council, states that the total cost of disposal of the sewage of that town, exclusive of loan repayments and interests for the year and the cost of the new works at the farm, was £670, which is equal to 11s. 9d. per house, being 1s. 5d. per house less than reported last year. During the year a double shift for pumping the sewage was [illegible] account of the small storage accommodation at the pumping station. Further, by this means the delivery of the sewage at the farm is spread over a longer period, while generally such a course would at any rate (Mr. Jenkins observes) have a beneficial tendency upon the health of the town as the sewers are thus prevented from being full of decomposing matters for a long period each day. These advantages have been gained at a reduced cost, as the regular wages paid to the second shift man do not amount to as much as was paid previously for overtime and casual labour during storms and wet weather.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of Surveyor *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Chester, Mid-Lothian, Plymouth, Swansea; housing and town planning—Greenock, Stamford; roads and materials—Berks, Tralee; sewerage and sewage disposal—Aylesbury, Chorleywood, Hemsworth; water, gas and electricity—Ashington.—Particulars of other projected works will be found on our "Local Government Board Inquiries" page.

ADMINISTRATION.

Newport (I.W.) T.C. -A special committee reported that they had decided that the borough surveyor shall employ, engage or discharge the town foreman and other town workmen, and shall have control over the engineer of the waterworks, in addition to the assistant surveyor, but not over the quay superintendent, and that the borough surveyor shall be manager of the sewage works, also manager of the waterworks in lieu of Mr. Way. The committee therefore recommended that in future Mr. Way be termed the waterworks engineer. The council approved the committee's report.

BUILDINGS.

Chester T.C.—The tuberculosis pavilion at Scaland, built at a cost of £1,750, was formally opened recently.

Gellygaer U.D.C.—Plans have been approved for an underground convenience at Ystrad Mynach. The estimated cost is £580.

Mid-Lothian C.C.—The Calder District Committee have agreed to feu to the county council a portion of their ground at Drumshoreland for the purpose of erecting a hospital for advanced cases of turberculosis.

North Riding C.C.—On the recommendation of the Highways and Bridges Committee, the council have agreed that a grant not exceeding £55 be made for repairs to Whorlton Bridge, a joint bridge repairable by Durham County and the North Riding; £67 for additional works in connection with the rebuilding of Flanders Bridge, in the Aysgarth rural district; £75 for repairing a defective portion of Scaling Dam Bridge, in the Whitby rural district; £80 for strengthening the arch of Nunthorpe Bridge, in the Stokesley rural district; and £129 for works and material in connection with the protection of the sea wall at Sandsend.

Plymouth T.C.—The Sanitary Committee recommend the corporation to adopt a scheme for the extension of the hospital accommodation, at an estimated cost of £8,496.

Skegness U.D.C. — The provision of a public abattoir is strongly recommended in the annual report of the medical officer, Dr. Stanley Wallace.

Sunderland T.C.—The lavatories in the municipal buildings are to be reconstructed, at an estimated cost of £115.

Swansea T.C. — The Finance Committee have approved a scheme for an open-air swimming bath for Llewelyn Park, at an estimated cost of £1,200, the work not to be undertaken until the end of the war.

Totnes R.D.C.—Owing to the heavy expenditure—probably £10,000—it has been decided to allow the matter of an isolation hospital to stand over *sine die*. No land or cottage has been taken for the purpose, and in case of an outbreak the council will have to provide temporary isolation.

Wilts C.C. -A scheme has been approved for extensions to the administrative block of the Swindon isolation hospital, at an estimated cost of £2,650.

HOUSING AND TOWN PLANNING.

Aldershot U.D.C. The surveyor, Mr. F. C. Uren, has received instructions to prepare plans and estimates for four workmen's dwellings at North Town, and also plans for converting a disused building into two cottages.

Caerphilly U.D.C.—The council have decided to invite architects and builders to attend a conference to consider the question of town planning and the alteration of the by-laws.

Greenock T.C.—Tenders are being invited for the erection of 150 houses in Roxburgh-street.

Middlesbrough T.C.—A communication has been received from the Local Government Board stating that they were prepared to sanction the erection by the corporation of 100 houses, to be let at rents from 5s. to 7s. per week. The town council, while recognising that houses are required, state that their proposed scheme has been suspended owing to the war.

Rathdown (No. 1) R.D.C.—In declining to hold an inquiry into the council's proposed housing scheme, the Local Government Board point out that even if the requisite funds were available, it would be highly desirable that the council should, in the interests of the ratepayers, defer the execution of the scheme until the present high prices of building materials, occasioned by the war, should again reach a somewhat normal standard.

Stamford T.C.—A tender, at £3,975, for the erection of working-class houses, having fallen through, it has been agreed to re-advertise for the work.

REFUSE COLLECTION AND DISPOSAL.

Bridlington T.C.—A tender amounting to £6,332 has been accepted for the erection of a refuse-destructor adjoining the electricity works.

ROADS AND MATERIALS.

Barnstaple R.D.C.—The council last week referred to a committee a letter from the County Council Bridges and Main Roads Committee calling on the council to appoint a second road surveyor at once.

Bath T.C.—The minutes of the General Purposes Sub-committee raised the question of the roads, and the chairman made a statement in which he said they had received many complaints with reference to street watering, and various letters had appeared in the Press making all sorts of charges against the committee and the officials. It ought to be pointed out to the ratepayers that the country was in a state of war, and it was very difficult indeed to carry on ordinary every-day work. As a matter of fact, it was impossible for the city surveyor, Mr. Fortune, to get enough horses to carry out the work of that committee and other committees. A week ago he had only eight horses left at his disposal, and next day two more were commandeered by the Government, leaving him six only. Try how he would, he could not get horses.

Berks C.C.- The scheme of the county surveyor, Mr. J. F. Hawkins, for resurfacing with Tarmac the sides of the Bath road between Reading and Maidenhead, at a cost of £11,862, has received the approval of the council.

Cleethorpes U.D.C.—The Local Government Board, while approving generally of the council's scheme for widening Grimsby-road, Clee-road, and Humberstone-road, state that a loan for the work cannot be sanctioned at present. The estimated cost is £6,250.

Colwyn Bay U.D.C.—It has been decided to execute repairs to the main road between Station-road and Marine-road, at an estimated cost of £156.

East Sussex C.C.—With reference to letters from various bodies asking the council to defer, during the war, all work in connection with the improvement of the road between Lewes and Newhaven, the council placed themselves in communication with the Road Board, and in consequence of the reply received they have proceeded with the work.

Flaxton R.D.C.—The surveyor, Mr. J. W. Lupton, has received authority to tar-macadamise the footpaths on the main roads instead of asphalting, as was intended. The county council will contribute a moiety of the cost.

Formby U.D.C.—It has been agreed to carry out repairs in Kirklake-road, at an estimated cost of £220.

Kincardine C.C. — A communication has been received from the Road Board with reference to the course it intended to pursue in regard to works of road improvement being carried out during the forthcoming financial year. The board proposed to make grants towards the cost of road improvements which

were immediately required. Unless special circumstances could be shown, such grants would be on a considerably reduced scale. The Board were not prepared to entertain any application at the present time for widenings, diversions, new roads or bridges, or the reconstruction of bridges.

Llanidloes T.C.—The town council received an intimation from the county council that it is their intention to spend £160 in diverting the brook in Longbridge road. It was agreed to contribute £25 towards the cost of the scheme.

Loughrea R.D.C.—The county surveyor, Mr. M. J. Kennedy, reported that he had amalgamated main roads and district roads, thus anticipating the council's declaration for a complete scheme of direct labour for the district. The contract system had utterly failed. The practice of contractors tendering for the fancy roads and leaving the more difficult ones could not continue, and it was most unfair to expect him (county surveyor) to act as road contractor, where everybody else had failed, without giving him the proper facilities. Consideration of the scheme was adjourned, and it was decided the roads which were out of contract be left in the hands of the county surveyor for three months.

Middlesbrough T.C.—The borough engineer, Mr. S. E. Burgess, has been instructed to prepare a scheme for laying out the Saltwells estate, which covers 39 acres.

St. Thomas R.D.C.—The county council, in reply to a resolution passed at the previous meeting of the council protesting against the expenditure on tar spraying, wrote that surface tarring was intended for the maintenance of the roads, and not to cope with the dust nuisance.

Sunderland T.C.—It is proposed to take up the existing stones in Fawcett-street, and relay them upon a bed of pitch, and grout them with pitch, at an estimated cost of £334, to be borne out of current revenue.

Tralee U.D.C.—The surveyor, Mr. A. G. Tough, has prepared a scheme of road improvements which the council have agreed to carry out, provided they can negotiate a loan of £1,730 with the local banks. Meanwhile provision is to be made at the rate of £300.

SEWERAGE AND SEWAGE DISPOSAL.

Aylesbury R.D.C.—A sewerage scheme for the village of Bierton, estimated to cost £900, has received the approval of the council. It has also been decided to prepare a scheme for outfall works in Cublington-lane.

Battle U.D.C.—It was reported that the council in committee had met Mr. W. Lawrence Bradley, the expert appointed for the sewage works, and discussed his report. He had expressed the opinion that the sewage could be properly dealt with on the ground belonging to the council by making use of certain osier-bed land; but it was stated that to remove the bed they would require the freehold of the land. In connection with this a letter from a firm of solicitors had been received stating that their clients were not prepared to sell the piece of land used as a osier bed. The council decided that Mr. Bradley's suggestion to have an informal interview with the Local Government Board should be accepted, and that if the scheme was entertained, an application should be made to the Local Government Board for a loan.

Belper R.D.C.—With respect to the construction of a brick and concrete storm-water culvert at Kilburne, for which tenders have been received, the surveyor, Mr. Robert C. Cordon, has received instructions to consult with the county surveyor, as the county council are contributing a proportion of the cost.

Chorleywood (Herts) U.D.C.—The council have instructed Mr. A. P. I. Cotterell, M.Inst.C.E., of Westminster and Bristol, to prepare a scheme of sewerage and sewage disposal for their district.

Hemsworth R.D.C.—The surveyor, Mr. T. H. Richardson, has prepared a scheme for the construction of a culvert in Carr-lane, South Kirkby, at an estimated cost of £333.

Llanidloes T.C.—It has been agreed to construct fencing around the sewage tanks at the sewage farm, and carry out other necessary repairs.

Oakham U.D.C.—The surveyor, Mr. A. L. Parker, reported recently that the new septic tanks and detritus chamber at the sewage works were now completed, and in working order. The whole of the work had been carried out by direct labour, at a total cost of £211, his estimate being £222. The tanks were designed at such a level to obtain sufficient head of water to work automatic sprinklers on bacteria filters, if required at any future time. They had a storage of eight hours' dry-weather flow, and, before the storm-water overflow came into operation, three times the dry-weather flow passed through the main tanks; consequently a good effluent should be obtained. For designing, preparing the plans, and supervising the work, the council voted the surveyor a sum of twelve guineas, and he was thanked for the efficient way in which he had carried out the work.

Stamford T.C.—A letter has been received from the Local Government Board stating that the board's inspector considered the present contact beds at the sewage farm were inadequate, and that some arrangement was needed for the separate treatment of the excess flow in times of storm. It also appeared that the 15-in. pipe from the contact beds to the irrigation area was very flat and could not be completely emptied, with the result that considerable deposit had taken place in it, a defect which should be rectified. The board further suggested that steps should be taken to prohibit any further firing of the tipped material at the refuse tips near the sewage works, and the tip covered up to the tipping-face with a layer of earth. The town council have decided to reply that they do not feel justified in spending a great sum of money on these works until the war is over.

WATER, GAS, AND ELECTRICITY.

Ashington U.D.C.—The Select Committee of the House of Lords, presided over by the Marquess of Bath, recently began consideration of the Bill promoted by the district council to authorise them to construct new waterworks and borrow £73,000 for the purchase of lands, easements, and works of construction, and £8,000 for extension of main service pipes. Mr. G. J. Talbot, K.C., opened the case for the promoters. The existing water supply, he said, was drawn from colliery workings, and the proposed new supply would be derived from spring wells in Great Tosson, Rothbury. Other works provided for in the Bill were to raise and filter water from wells and store it. All the works were to be executed within seven years. The chief opposition to the Bill came from the Tynemouth Corporation, who asked that Ashington should be compelled to take their water supply from them; whereas Ashington thought that they could get their necessary supply better and more cheaply for themselves. Other opposition came from the Duke of Northumberland, whose mills on the Coquet River, it was asserted, would be injured, and from the Coquet Fishery Board. Mr. Charles Alderson, clerk of the Ashington Council, gave evidence.

Harrington U.D.C.—The council have appointed Mr. Joseph Graham, of Carlisle, engineer and adviser in respect of the proposed new water supply scheme.

Nuneaton T.C.—It was reported at Wednesday's meeting that during 1914 there had been a profit on the electricity works of £878 and on the water undertaking of £420.

Rothes T.C.—The surveyor, Mr. A. Robb, has received instructions to prepare estimates for extensions to the water supply and the construction of a storage tank.

Totnes R.D.C.—It has been decided to proceed with the Bittaford water scheme, the owner of the water agreeing to contribute £20 towards the cost of a larger pipe.

MISCELLANEOUS.

Birmingham T.C.—The purchase of an additional motor ambulance at a cost of £630 is recommended.

Brighton T.C.—The council have agreed to a proposition that the minimum wage paid to able-bodied married employees over twenty-one be increased from 25s. to 27s. 6d. per week during the continuance of the war and for a period of three months after the declaration of peace. The council have also authorised each committee to grant a war bonus of 2s. 6d. a week to all regular employees of the corporation above the age of twenty-one years, who are not entitled to the council minimum wage, such bonus to remain in force for three months after the close of the war.

Mansfield T.C.—It has been decided during the continuance of the war to make the following additional

payments to employees of the corporation in respect of the increased cost of necessities: That married men and single men having relatives actually dependent on them, who are in the permanent employ of the corporation, and are in receipt of 29s. per week or under, be granted on additional sum of 2s. 6d. per week, and those who are in receipt of over 29s. and under 40s. per week be granted an additional sum of 1s. 6d. per week, this grant not to apply to men who have received an advance in their wages since January 1, 1915.

York T.C. The Local Government Board have authorised the corporation to carry out the proposed extension of the tramways from Nessgate to Hullroad. This was one of the works which the corporation submitted was of urgent necessity, and, having regard to the expense already incurred, would involve heavy loss if it were postponed.

PERSONAL.

Mr. Henry C. Hall, surveyor to the Naas Urban District Council, has had his salary increased.

Mr. Edward Daly has been appointed to the position of surveyor by the Bundoran (Ireland) Town Commissioners.

Mr. G. G. Cornish, highways surveyor of the North District, Tavistock Rural District Council, has had his salary increased.

Mr. R. C. Bryan, second surveyor to the Louth Rural District Council, has been appointed surveyor and sanitary inspector to the Wirksworth Urban District Council.

Mr. Valentine D. Doyle, of Athlone, was, at the quarterly meeting of the Longford County Council last week, unanimously appointed to the vacant office of county surveyor.

Mr. T. Skidmore has resigned his position as sanitary inspector of Mansfield, and the council have agreed to a recommendation that Mr. B. Allman be appointed to fill the vacancy, and that the services of an assistant be obtained.

Major T. Hunter, V.D., borough engineer of Leigh, Lancashire, has rejoined his old battalion, the 5th Manchester Territorials, and has been appointed to command the administrative centre of the regiment. The corporation have granted Major Hunter leave of absence.

Mr. T. H. Scott's resignation of the office of burgh surveyor of Inverness was accepted with regret by the town council on Tuesday. It was agreed to advertise for a successor at a salary of £250 per annum. The council decided that only men above military age should apply.

Mr. John A. Hunter, pupil to the surveyor to the Newburn Urban District Council, is with the 4th Battalion of the Northumberland Fusiliers. Mr. Hunter has already seen active service near Ypres, when the Northumberland Brigade and the Canadians so gallantly held the Germans in check.

Mr. L. S. Mackenzie, city engineer of Bristol, and Mr. W. Harpur, city engineer and surveyor of Cardiff, are among those who will speak at the forthcoming meeting of the Royal Sanitary Institute at Bristol, at which Lieutenant-Colonel D. S. Davies will open a discussion on the Co-ordination of Military and Civil Sanitary Services in War Time.

Mr. Richard Gamble, son of the second officer of the London Fire Brigade, has been killed in action. His father, Mr. Sidney G. Gamble, ASSOC.M.INST.C.E., F.S.I., received a training in municipal engineering as second assistant to the borough engineer of Leeds, his native place, in 1875. In the following year he was appointed borough surveyor, in which post he won the confidence and respect of his fellow-townsmen. In 1903 the London County Council placed the whole of the county south of the Thames, and the river service, under his direct charge.

Mr. Thomas Forster, of Newburn-on-Tyne, has been gazetted 2nd Lieutenant in the Royal Engineers. Mr. Forster served his articles with Mr. Thomas Gregory, surveyor to the Newburn Urban District Council, and upon the completion of these he obtained an appointment in the architectural department of the North-Eastern Railway Company as assistant designer of steel and ferro-concrete structures. He then went to Canada and obtained an appointment as assistant engineer for the Canadian Pacific Railway Company, and later held the appointment of assistant engineer to the city of Medicine Hat. Prior to the outbreak of war he had gone back to the Canadian Pacific Railway Company as assistant engineer at Toronto, from which place he offered his services to the War Office.

Mr. S. F. R. Carter, ASSOC.M.INST.C.E., deputy engineer and surveyor to the Heston and Isleworth Urban District Council, was on Friday last unanimously appointed surveyor to the newly-formed urban district of Beddington and Wallington out of over 250 applicants. Mr. Carter, who has had nearly twenty years' experience in municipal work, was articled to Mr. Donald Cameron, late city engineer and surveyor of Exeter, and subsequently held appointments at Enfield, Putney and Wandsworth, previous to going to Heston and Isleworth. He has been associated with Mr. J. G. Carey, ASSOC.M.INST.C.E., chief engineer and surveyor to the Heston and Isleworth Urban District Council, for the past nine years, during which time considerable development of the district has taken place, and large and important public works have been carried out. Mr. Carter handed in his resignation to the Heston and Isleworth Council on Tuesday evening last, when eulogistic references were made by several members of the council as to the excellent services he had rendered during his tenure of office with them. Mr. Carter is an associate-member of the Institution of Civil Engineers, and a member of the Institution of Municipal and County Engineers.

FOR OTHER ADVERTISEMENTS
See End of Paper.

BOROUGH OF STAMFORD.
TENDERS FOR GRANITE.

The Town Council of Stamford invite Tenders for about 1,500 tons of "X" Broken Granite, to be delivered free in trucks at Stamford Station as and when required during the months from June, 1915, to March, 1916, inclusive.

Tenders, with Samples, to be sent to the undersigned on or before June 10th, 1915.

FREDK. R. RYMAN, ASSOC.M.INST.C.E.,
Borough Surveyor and Engineer.

Town Hall, Stamford.
May 26, 1915. (2,589)

METROPOLITAN BOROUGH OF WOOLWICH.
APPOINTMENT OF BOROUGH ENGINEER AND SURVEYOR.

The Council of the Metropolitan Borough of Woolwich invite applications for the appointment of Borough Engineer and Surveyor. Applicants must be Members or Associate-members of the Institution of Civil Engineers.

The salary attached to the office, to include all fees and emoluments, will be £500 per annum, rising, on approved service, by annual increments of £50 to £650.

The candidate to be appointed will be required to devote the whole of his time to the service of the Council, and will not be allowed private practice, nor to hold any other appointment.

Preference will be given to candidates with experience in carrying out works by direct labour.

The appointment will be held during the pleasure of the Council, and will be subject to the by-laws and regulations of the Council in force from time to time.

Particulars of the duties and any further information may be obtained upon application to me.

Applications, stating age, experience and qualifications, and accompanied by copies of not more than three recent testimonials, must be sent to me at the Town Hall, Woolwich, not later than 10 a.m. on Monday, the 14th day of June, 1915, endorsed "Appointment of Borough Engineer."

Any candidate canvassing a member of the Council, either personally or through any other person, will be disqualified; but no objection will be made to a candidate sending a copy of his application and testimonials.

(By order)
ARTHUR B. BRYCESON,
Town Clerk.

Town Hall,
Woolwich.
May 26, 1915. (2,590)

ENGINEERING ASSISTANT, with some practical experience, desires further experience with Engineer or Contractor; will pay premium for good experience.—Box 1,524, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (2,591)

TEMPERATURE CHANGES IN MASS CONCRETE.*

By Charles H. Pike, M.Am.Soc.C.E., and A. B. Maydole, M.Am.Soc.C.E.

[illegible] the structural problem [illegible] in long [illegible] to [illegible] reality [illegible] free to [illegible] a change in the [illegible] equal to the [illegible] to produce [illegible] in length. In [illegible] decrease [illegible] a change in [illegible] the [illegible] the material [illegible] is to be expected [illegible] in the [illegible] exposed. In large [illegible] the [illegible] temperature [illegible] the [illegible] are [illegible] and [illegible] due to the [illegible] a [illegible] together [illegible] the [illegible] of [illegible] cause [illegible] the [illegible] to place [illegible] the [illegible] far obtained of experiments being made to determine [illegible] temperature [illegible] the [illegible] Arrowrock Dam, [illegible] with a description of [illegible] used. Although some of these [illegible] have been [illegible] the greater part of the results [illegible] high temperature produced by chemical action while [illegible] be largely descriptive, and should be considered in [illegible] a preliminary paper. Among [illegible] are [illegible] the following:

(1) Large bodies of concrete deposited rapidly [illegible] a certain [illegible] a temperature of [illegible] 90 deg. to 95 deg. within a period of about thirty days, and maintain nearly that temperature for several months.

(2) In the case of [illegible] 2 ft. [illegible] an exposed face, there is a daily variation in temperature of about 2 deg. when the daily variation in the temperature of the air is about 20 deg.

(3) In the case of [illegible] 2 ft. [illegible] an exposed face, there is a daily variation of less than 1 deg. when the daily variation in the temperature of the [illegible] about 20 deg.

(4) In the case of [illegible] 2 ft. [illegible] an exposed face, no daily variation in temperature is apparent when the daily variation in the temperature of the air is about 50 deg.

(5) The seasonal variation in the temperature of [illegible] 2 ft. [illegible] an exposed face is about 50 deg., when the seasonal variation in the mean daily temperature of the air is about 75 deg.

(6) The experiments have not yet been carried far enough to show the seasonal variation at other distances from exposed faces, but it is probable that they become very much less as the distance from the face increases.

PETROL AND PATRIOTISM.

BIG INCREASE IN THE DEMAND FOR MEX SPIRIT.

The well-worn and, in the past, much-neglected phrase "Support British Industries" has received a new life and vigour with the present war. In every circle of industry British goods are now receiving their rightful preference. The motoring community, by no means the least patriotic section of the public, has promptly responded to the national movement, and in the matter of petrol motorists to-day are keen to use only a brand which is entirely free from any enemy influence or control. This is one of the reasons for the great increased popularity of Mex motor spirit, a product of the Mexican Eagle Oil Company, Limited, which company, as most of our readers are aware, was created by the famous house of S. Pearson & Son, Limited.

"Mex," as its name implies, is distilled from the great oil wells of Mexico. It is produced by British capital, brought over in British ships (which, by the way, are the largest oil-tankers in the world), and is packed and distributed by British labour.

The distributing agents for the United Kingdom—the Bowring Petroleum Company, Limited, of London and Liverpool—is the oldest established oil-distributing company in this country, and, needless to add, is and always was an entirely British firm.

* From a paper presented at a meeting of the American Society of Civil Engineers.

Research Scholarships in Technology.—The Manchester Municipal School of Technology, University of Manchester) give notice that ten research scholarships in technology (one of the value of £80, three of the value [illegible] remitted) will be awarded on or about July 5, 1915. The scholarships are tenable during the academic year 1915-16 in the Manchester School of Technology (Faculty of Technology in the University of Manchester). Applications must be received on or before June 21, 1915. Forms of application and all information may be obtained, by letter only, addressed to the Registrar, School of Technology, Manchester.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

NORTHWICH MEETING.

A North-Western District meeting is to be held at the Council Offices, Northwich, to-day (Friday).

PROGRAMME.

11 [illegible] District [illegible] meeting.

11.30 a.m. District meeting.
Reception in the council chamber by the chairman of the council, Mr. Councillor Worsley, J.P.
District business.
Paper by Mr. J. Brooke, engineer and surveyor, on "Municipal Works of Northwich," which will be taken as read.
Discussion.

12.45 p.m.—Visit to baths.

1 p.m. Lunch at Lion and Railway Hotel (tickets 3s. each).

2 p.m.—Leave Lion Hotel.

2.15 p.m.—Arrive Marston salt rock mine.

2.[illegible] p.m.—Leave Marston salt rock mine.

3.20 p.m.—Arrive Anderton Eft.

4 p.m.—Leave Anderton lift.

4.05 p.m.—Arrive swing bridge.

4.30 p.m.—Leave swing bridge.

4.35 p.m.—Arrive sewage pumping station.

4.50 p.m.—Leave sewage pumping station.

5.20 p.m.—Arrive Cote Brook waterworks.

6 p.m.—Leave Cote Brook waterworks.

6.15 p.m.—Arrive Blue Cap Hotel (tickets for tea 2s. each).

7.20 p.m.—Leave Blue Cap Hotel.

Tickets for motor char-à-banc 2s. 6d. each.

It is necessary that the [illegible] of persons attending this meeting should be declared.

A. W. Bradley, M.Inst.C.E.,
Hon. District Secretary.

St. Helens.

SOUTHALL MEETING.

A meeting of the Eastern District will be held at the Town Hall, Southall, on Saturday, June 5th.

PROGRAMME.

2 p.m.—Meet at Town Hall, Southall.
Business.
Read minutes of previous meeting.

2.30 p.m.—Proceed by motor omnibus (fare 1s. 6d. each) to
(*a*) To visit open-air bath;
(*b*) Through Osterly Park to inspect sewage disposal works.

4.30 p.m.—Return to town hall to tea, kindly provided by the engineer and surveyor, Mr. Reginald Brown, M.Inst.C.E.

5.15 p.m.—Discussion of works inspected, and papers by Mr. Reginald Brown (member), "Fourteen Years' Municipal Work in a London Suburb," and Mr. J. H. Edmondson, F.C.S., "Further Experiments and Working of a Sewage Works Laboratory."

Conveyances for the various visits have been arranged, tickets 1s. 6d. each.

J. A. Webb,
Hon. District Secretary.

Great Stanmore.

AYR MEETING.

The annual Scottish District meeting of the institution will be held at Ayr on Friday and Saturday, June 4th and 5th next.

PROGRAMME.

Friday, June 4th.

11 a.m.—Business meeting in County Hall, County Buildings, Ayr.

11.30 a.m.—Discussion on the following papers:

"Suggested Town Planning Details for Scottish Conditions," by John Bryce, M.INST.C.E., Office of Public Works, Glasgow, with criticisms by some members of the Town Planning Committee of the Scottish District.

"Pressure Scraping 15 miles of Water Mains," by James McFadzean, B.SC., ASSOC.M.INST.C.E., assistant burgh engineer, Ayr.

1 p.m.—Reception by the Ayr County Road Board and the provost and magistrates of Ayr in the County Hall.

1.15 p.m.—Luncheon in the Lesser County Hall, County Buildings, kindly provided by the County Council of Ayr.

2.30 p.m.—Discussion on the following papers:—

"Road Work," by R. Drummond, C.E., county road surveyor, Renfrewshire County Council, Upper District.

"Description of Experimental Stretches of Road Laid in the Ayr District, Ayr County, and Meteorological Station in Connection Therewith," by Allan Stevenson, C.E., county road surveyor, Ayr County Council, Ayr District.

"Municipal Housing," by Wm. A. Macartney, ASSOC.M.INST.C.E., burgh engineer, Johnstone.

4.15 p.m.—MUNICIPAL WORKS, &c., TO BE VISITED.

(1) Visit to refuse destructor, electricity station, hospital extension, pavilion and esplanade, tar-macadam roads, &c.

Carriages (kindly provided by the Corporation of Ayr) will leave the County Hall at 4.15 p.m.

(2) Visit to Burns Monument and cottage, by kind invitation of the Corporation of Ayr.

Tramway cars will leave town hall at 4.15 p.m., arriving back at 6.30 p.m.

Tea will be served in the tea gardens at 5 p.m.

NOTE.—The time allotted will only permit of members visiting one of the above.

7.30 p.m.—Annual Dinner in Station Hotel. Tickets, 7s. 6d. each.

Saturday, June 5th.

VISIT TO EXPERIMENTAL STRETCHES OF ROAD AND METEOROLOGICAL STATIONS IN THE AYR DISTRICT AYR COUNTY, HILLHOUSE QUARRY AND TROON.

9.45 a.m.—Motor chars-à-banc will leave Station Hotel at 9.45 a.m. prompt, and proceed to the experimental stretches of road, Hillhouse Quarry, and Troon.

1 p.m.—Luncheon (kindly provided by the Hillhouse Quarry Company) will be served in the South Beach Hotel, Troon, at 1 o'clock, after which the return journey will be made to Ayr, arriving at 2.30 p.m.

Tickets for motor chars-à-banc, 3s. 6d. each.

CIRCULAR TOUR BY MOTOR CHAR-À-BANC TO LOCH DOON, VIA PATNA AND DALMELLINGTON, FOR NITH GLEN.

2.30 p.m.—Motor char-à-banc will leave Station Hotel at 2.30 p.m., arriving back at 6.40 p.m.

5 p.m.—Tea will be served at Dalmellington at 5 p.m. Ticket for motor char-à-banc and tea, 8s each.

6.50 p.m.—Trains leave Ayr Station for Glasgow at 6.50 p.m.

Mr. Young, burgh engineer, Ayr, has kindly offered to arrange for ladies present being well looked after during the meetings on Friday forenoon and afternoon, and also on Saturday forenoon.

DAVID A. DONALD,
Hon. District Secretary.

Grangemouth.

MATLOCK MEETING.

The arrangements for the institution meeting to be held at Matlock on June 12th include visits to the new sewage works, the brine and electric baths, and other undertakings.

J. W. DUDLEY ROBINSON,
Secretary.

INSTITUTION OF MUNICIPAL ENGINEERS.

EASTERN, NORTH-EASTERN AND SOUTH-EASTERN DISTRICTS.

A meeting of these districts will be held at Dunstable to-morrow (Saturday).

PROGRAMME.

1.30 p.m.—Reception at the town hall by his Worship the Mayor of Dunstable, Mr. F. T. Garrett, J.P.

2 p.m.—Leave town hall by conveyance. (Approximate cost of conveyance, 1s. 6d. per head.)

2.15 p.m.—Arrive at sewage disposal works.

3 p.m.—Leave sewage disposal works.

3.10 p.m.—Arrive at gasworks.

3.30 p.m.—Leave gasworks, and proceed on foot to Maiden Bower (old British camp), onward by Green Way (old British road) to Totternhoe Knolls (old British and Roman camps). Inspect cottages erected by the Luton Rural District Council at Totternhoe.

4.30 p.m.—Proceed by conveyance to waterworks, &c.

5.20 p.m.—Tea at Dunstable, by kind invitation of the Mayoress.

Descriptive notes on the various undertakings and inspections will be given by Mr. W. F. Wilkins, borough surveyor, Dunstable, and Mr. H. Pickering, surveyor, Luton Rural District Council.

Trains leave Luton (G.N.R., adjoining M.R. Station) for Dunstable at 12.20, 1.5 and 1.30, and Leighton Buzzard (L. & N.W.R.) for Dunstable at 12.25.

Trains leave Dunstable for Luton at 6.15 and 7.25, and for Leighton Buzzard at 6.5 and 8.13.

G. BELSON CHILVERS,
Hon. District Secretary,

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

WIMBLEDON MEETING.

To-morrow (Saturday), a visit will be paid to the Wimbledon sewage works and the S.O.S. works, Durnsford-road, Wimbledon, near Wimbledon Park Station (District Railway).

Members to meet at 3 p.m. at pumping station, Durnsford-road, to view the pumping plant, lime mixing plant, filters and sludge pressing plant, the atomisation of sewage devised by the borough engineer (Mr. C. H. Cooper, M.INST.C.E.), and the recovery of fats resulting from such treatment. Afterwards an inspection will be made of the S.O.S. works, and the products resulting from the destructive distillation of sewage sludge.

MANCHESTER MEETING.

By permission of the Rivers Committee of the Manchester Corporation, a visit to the sewage disposal works at Davyhulme (Urmston) has been arranged for Saturday, June 5th, at 3 p.m.

The works are about 1 mile from Urmston Station.

OBJECTS OF INTEREST.

Experiments in sewage purification by aëration without filtration.

The following is a brief description of the works:—

Dry-weather flow, 28,000,000 gallons; average daily flow, 36,000,000 gallons; maximum flow, 171,000,000 gallons per twenty-four hours.

The existing outfall sewer, 10 ft. diameter, discharges into detritus tanks and screening chambers, and then into a series of twelve settling tanks having a total capacity of 16,000,000 gallons, after which the tank effluent passes on to the primary contact beds, 3 ft. 6 in. deep, ninety-two in number, and having a total area of 46 acres.

The effluent from the primary beds is conveyed by a 13-ft. rectangular channel to the secondary contact beds, containing over 100,000 tons of broken Irish granite for filtering, and having a total area of 38 acres. The final effluent passes into the Manchester Canal below Barton Locks.

Other interesting features are the clinker washer, sludge drying sheds, where humus, washed from the filtering material, is pressed into cake, and sold at 25s. per ton; several Venturi meters in operation; the sludge tanks and sludge steamer, the s.s. "Joseph Thomson;" the sedimentation tanks (capacity 4,500,000 gallons) for storm water; compressed air ejectors for lifting sludge, &c.

The estimated cost of the scheme of extensions is

[illegible] and the plant forms the largest complete [illegible] in the world.

The [illegible] will be in attendance to receive the party and conduct them over the works. Mr. C. H. Ball, M.R.SAN.I. (manager), has kindly arranged to provide the visitors with light refreshments.

ROYAL SANITARY INSTITUTE.

SHREWSBURY MEETING.

Mr. H. Percy Boulnois, M.INST.C.E., will occupy the chair at a meeting of the Royal Sanitary Institute which is to be held at the Guildhall, Shrewsbury, to-day (Friday), when a discussion on "The Value of Mechanical Filters in the Purification of Water" will be opened by Dr. Thomas Orr.

The proceedings will commence at 7.30 p.m.

To-morrow morning inspections will be made of the Shrewsbury housing scheme, Ditherington, mechanical filters at Chester-street, and the public abattoir. The members will be entertained to luncheon at one o'clock by the mayor.

BRISTOL MEETING.

A sessional meeting will be held on Friday, June 11th, in the Civil Court, Guildhall, Bristol, when a discussion, to be opened by Lieutenant-Colonel D. S. Davies, medical officer of health, Bristol, and Mr. L. S. Mackenzie, ASSOC.M.INST.C.E., city engineer, Bristol, will take place on "The Co-ordination of Military and Civil Sanitary Services in War Time."

The chair will be taken at 11 a.m. by Lieutenant-Colonel H. R. Kenwood, M.B., D.P.H.

1.15 p.m.—Luncheon at [illegible] Restaurant, Wine-street, Bristol. (2s. 6d. each.)

2.30 p.m.—Proceed to [illegible] Brandon-street, in Saltford, and visit the Bath new sewage works, and to Twerton to inspect the pumping station. The party will be conducted over the works by Mr. W. H. Rowland, [illegible] (Tickets for motor, 2s. 3d.)

5.15 p.m.—Tea at the Old Red House, New Bond-street, Bath. (Tickets for tea, 1s. 3d. each.)

6.15 p.m.—Motors leave Bath for Bristol.

Tickets for the admission of visitors may be had on application to Lieutenant-Colonel D. S. Davies, M.D., medical officer of health, Prince-street, Bristol, or of Mr. T. J. Macdonald, Carlton Chambers, 29 Baldwin-street, Bristol, who is acting as hon. local secretary of the meeting, and of Mr. E. White Wallis, secretary.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

BOROUGH SURVEYOR'S GENERAL ASSISTANT.—May 29th. Corporation of Burton-upon-Trent. £100 a year. Borough Surveyor.

CHIEF INSPECTOR OF NUISANCES.—May 29th. Corporation of Plymouth. £170–£220. Mr. O. Hall, medical officer of health, Town Hall.

INSPECTOR OF NUISANCES.—May 29th. Dorking Rural District Council. £120 a year. Mr. W. J. Down, clerk.

SURVEYOR.—May 31st.—Llanfrechfa Urban District Council. £146 per annum.—Mr. William Clark, clerk, 44 Coronation-road, Cwmbran, near Newport, Mon.

SURVEYOR'S ASSISTANT.—May 31st.—Corporation of Beverley. £65 per annum.—Mr. J. Gould Smith, borough surveyor, 31 Lairgate, Beverley.

ASSISTANT SANITARY SURVEYOR.—May 31st.—Hemel Hempstead Rural District Council. £90 a year. Mr. L. Smeatham, clerk, The Broadway, Hemel Hempstead.

CLERK OF WORKS.—May 31st.—Finchley Urban District Council. £4 4s. per week. Mr. E. H. Lister, clerk.

ENGINEMAN.—June 1st.—Weybridge and Oatlands Joint Sewerage Committee. 35s. per week, with cottage, light and coal.—Mr. John S. Crawshaw, surveyor, Council Offices, Weybridge.

SURVEYOR AND INSPECTOR.—June 1st. Seaham Harbour Urban District Council. £200 per annum.—Mr. J. W. Richardson, clerk.

ENGINEERING ASSISTANTS.—June 7th.—Finchley Urban District Council. £120 per annum.—The Engineer and Surveyor.

ROAD FOREMAN.—June 7th.—Brighouse Town Council. 45s. per week.—Borough Engineer.

REFUSE DESTRUCTOR SUPERINTENDENT.—June 7th.—Corporation of Coventry. £3 5s. per week.—Mr. J. E. Swindlehurst, city engineer and surveyor.

SURVEYOR AND WATER ENGINEER.—June 8th.—Bridgwater Rural District Council. £250—£325.—Mr. T. M. Read, clerk, Rural District Council Offices, Bridgwater.

WORKING WATERWORKS FOREMAN.—June 8th. Paignton Urban District Council. 30s.—40s. per week. Mr. James A. Hutchinson, waterworks engineer and manager, Town Hall.

INSPECTOR OF NUISANCES.—June 11th.—Spenborough Urban District Council. £150 a year.—Mr. John H. Linfield, clerk, Town Hall, Cleckheaton.

INSPECTOR OF NUISANCES.—June 14th.—Colwyn Bay Urban District Council. £150 per annum.—Mr. J. Amphlett, clerk.

DISTRICT SURVEYORS (2).—June 18th.—London County Council.—The Clerk, County Hall, Spring-gardens, S.W.

TEMPORARY CLERK.—Corporation of Cheltenham.—Borough Engineer, Municipal Offices, Cheltenham.

SANITARY INSPECTOR.—Finsbury Borough Council. £3 per week.—Medical Officer of Health, Town Hall, Rosebery-avenue, London, E.C.

DRAUGHTSMAN.—Public Works Department, Government of the Gold Coast. £250—£300.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ASSISTANT ENGINEERS.—Public Works Department, Government of the Gold Coast. £350—£400.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

HASTINGS.—May 31st.—For the erection of bandstand and covered shelters, for the corporation.—Mr. P. H. Palmer, borough engineer.

DEWSBURY.—May 31st.—For the erection of buildings in connection with the Whitley Sanatorium, for the corporation.—Borough Surveyor, Town Hall.

AYR.—June 2nd.—For the erection of a porter's lodge, mortuary, boundary walls, and entrance gates, and the construction of roads at Heathfield hospital, for the corporation.—Mr. J. Young, burgh surveyor.

GOOLE.—June 2nd.—For the erection of a cooling-room at the slaughter-house, for the urban district council.—Mr. J. H. Castle, engineer and surveyor.

LLANDUDNO.—June 2nd.—For alterations and additions to cottages, and the conversion of two cottages into a golf-house, for the urban district council.—Mr. W. T. Ward, deputy engineer and surveyor.

STAMFORD.—June 4th.—For the erection of twenty-four houses, for the corporation.—Mr. F. R. Ryman, borough engineer, Town Hall.

DUNDEE.—June 4th.—For making reinforced-concrete floors and jointless flooring at generating station, for the corporation.—Mr. H. Richardson, general manager and engineer, Electricity Department, Dundee.

GRIMSBY.—June 5th.—For alterations to "Rutland House," for the rural district council.—Mr. J. F. Wintringham, St. Mary's Chambers, Grimsby.

SOMERSET.—June 5th.—For carrying out sea defence works at Blue Anchor, near Minehead, for the county council.—Mr. Edward Stead, county surveyor, Wells.

FARNBOROUGH.—June 7th.—For the supply and erection of a standard type steam disinfector and

machinery, horse-drawn ambulance, and the erection of corrugated-iron disinfection station, for the urban district council.—Mr. J. E. Hargreaves, engineer and surveyor.

SHORTLANDS. June 7th. For the construction of a subway and other contingent works, for the Metropolitan Water Board.—Chief Engineer, Savoy-street, Strand, W.C.

LAMBETH.—June 8th.—For the execution of work in connection with the painting and cleaning of the infirmary, for the Board of Guardians.—Mr. James L. Goldspink, clerk, Board Room, Brook-street, Kennington, S.E.

GREENOCK.—June 15th.—For the erection of 150 houses, for the corporation.—Office of Public Works, Municipal Buildings.

CASTLEBAR.—June 19th.—For building four cottages, for the rural district council.—The Clerk.

ALDERSHOT. For the re-erection of a temporary hospital. Offers invited from owners of wood or iron buildings.—Mr. F. C. Uren, surveyor.

Iron and Steel.

WIGAN.—May 31st.—For the supply and erection of a Lancashire boiler, for the Gas Committee.—Gas Engineer, Gasworks, Wigan.

PORTSMOUTH.—June 1st.—For the supply of tram rails, fishplates and iron tiebars, for the Tramways Committee.—Mr. V. G. Lironi, engineer, Fratton-grove, Portsmouth.

MANCHESTER.—June 2nd.—For the supply and erection of coal-unloading crane, and conveying plants, for the Electricity Committee.—Mr. F. E. Hughes, secretary, Electricity Department, Town Hall.

NAAS.—June 2nd.—For supplying and erecting gas engines and suction-gas plant, and constructing cast-iron service reservoir, for the rural district council.—Mr. F. Bergin, engineer, 36 Westmoreland-street, Dublin.

MANCHESTER.—June 4th.—For providing and erecting two sets of faces for gas and steam turbines, for the Gas Committee.—Mr. F. C. Price, superintendent, Town Hall.

RHONDDA. June 4th. For the erection of cast-iron water storage tank, for the urban district council.—Mr. J. M. Bowman, Destructor Works, Porth, Rhondda.

ROTHWELL. June 4th. For the construction of stoneware and cast-iron pipe collecting drain, with junctions, manholes and washouts, for the urban district council.—Messrs. Everard, Son & Pick, 6 Millstone-lane, Leicester.

BALLYMENA.—June 5th.—For supplying and laying cast-iron water pipes, for the urban district council.—Messrs. Swiney & Croasdaile, engineers, Avenue Chambers, Belfast.

MADRAS.—July 14th. For the supply of cast-iron pipes, special castings, sluice valves and hydrants, for the corporation.—Mr. J. W. Madeley, special engineer; agents, Messrs. James Mansergh & Sons, 5 Victoria-street, Westminster, London, S.W.

RANGOON.—August 11th.—For the installation of a system of fire alarms, for the municipality.—Messrs. Ogilvy, Gillanders & Co., 67 Cornhill, London, E.C.

HALIFAX. June 12th. For the supply and fixing of a hot-water boiler, for the Education Committee.—Mr. J. Lord, borough engineer.

Roads.

ROWLEY REGIS. May 31st.—For work of tar-spraying, for the urban district council.—The Surveyor.

WANTAGE.—May 31st.—For the supply and hauling of hand-picked stones and rubble, for the rural district council.—Mr. J. H. Robinson, surveyor, East Ilsley.

FINCHLEY.—May 31st.—For making up part of a road, for the urban district council.—Mr. C. J. Jenkin, engineer.

ELY.—May 31st.—For the supply of machine-broken Leicester granite, for the urban district council.—Mr. W. McKelvie, surveyor.

TILBURY.—May 31st.—For the supply of 10,000 gallons of approved refined tar, complying with the Road Board Specification No. 4 for Tar No. 1, also laying 1,000 sq. yds. bituminous-bound granite (graded), 1,000 sq. yds. of tarred slag macadam, and 1,000 sq. yds. of tar-paving, for the urban district council.—Mr. S. A. Hill-Willis, engineer and surveyor.

FINCHLEY.—May 31st.—For making up Holly Park, for the urban district council.—Mr. C. J. Jenkin, engineer.

DUBLIN.—May 31st.—For the supply of a 10-ton steam roller, with scarifier, for the corporation.—Mr. M. J. Buckley, city engineer, 28 Castle-street.

SOYLAND.—May 31st.—For the supply of 750 tons of broken granite, for the urban district council.—Mr. W. Whitehead, surveyor, Council Offices, Ripponden, Yorks.

BEDWELLTY.—June 1st.—For street widening and tar-gravelling, for the urban district council.—Mr. D. H. Price, surveyor, Aber Bargoed.

MANCHESTER.—June 1st.—For the supply of Haslingden flags and kerbs, Haslingden dressed grit crossing setts, flags for manhole covers, flags for coal grids, grit, and limestone and granite chippings, for the corporation.—Secretary of the Paving Committee, Town Hall.

DOVER.—June 1st.—For the supply of 600 tons of granite, for the rural district council.—The Clerk, Workhouse, Buckland, Dover.

PONTYPOOL.—June 2nd.—For the supply and hauling of limestone, for the rural district council.—Mr. R. O. Roberts, district surveyor, Usk.

ORSETT.—June 2nd.—For the supply of 2,000 cub. yds. of broken Kentish ragstone, for the rural district council.—Mr. F. T. Johnson, highway surveyor, 2 Orsett-road, Grays.

NEW SHOREHAM.—June 5th.—For the supply of 400 yds. of surface hand-picked land flints, or, alternatively, 400 yds. of dug pit flints, for the Harbour Trustees.—Chairman, Works Committee, Harbour Offices, Southwick.

WANDSWORTH.—June 7th.—For making up Bracken-avenue, Putney, for the borough council.—Borough Surveyor.

BOLLINGTON.—June 9th.—For the supply of 300 tons of granite macadam, for the urban district council.—Mr. S. Knight, clerk, Council Office, Bollington, near Macclesfield.

WESTMINSTER.—June 10th.—For the execution of paving works and the supply of wood blocks, for the city council.—Town Clerk.

DURHAM.—June 11th.—For the supply of about 12,000 tons of granite cubes and other size granite setts, for the county council.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

TIPPERARY.—June 12th.—For the supply of four 6-ton end-tipping wagons, for the county council.—County Surveyor, Court House, Nenagh.

EAST SUSSEX.—June 14th.—For hiring steam rollers and scarifiers, for the county council.—Mr. Fred J. Wood, county surveyor, County Hall, Lewes.

TOTTENHAM.—June 15th.—For tar and asphalt paving repairs, for the urban district council.—The Engineer.

LEWES.—June 18th.—For road rolling and the supply of 600 tons of 2 in. broken granite and 600 tons of broken surface-picked flints, for the corporation.—Borough Surveyor.

Sanitary.

FINCHLEY.—May 31st.—For the construction of soil and surface-water sewers in connection with the Woodhouse estate workmen's dwellings scheme, for the urban district council.—Mr. C. J. Jenkin, engineer and surveyor.

EPSOM.—May 31st.—For the removal of house refuse, for the rural district council. — Mr. F. A. Pratley, surveyor, Waterloo-road, Epsom.

CUDWORTH.—June 7th.—For the construction of sewage disposal works, including screen chamber, detritus tanks, liquefying tanks, storm tanks, percolating filters, sludge beds and humus tanks, for the urban district council.—Mr. W. T. Lynam, engineer and surveyor, Council Offices.

SEDGEHILL.—June 8th.—For the removal of house refuse, for the urban district council.—Mr. T. Spencer, clerk.

WANDSWORTH.—June 10th.—For surface drainage at Putney Vale cemetery, for the borough council.—Mr. P. Dodd, borough engineer, 215 Ballam Hightroad, S.W.

HAMBLEDON.—June 12th.—For the collection and removal of refuse, for the rural district council.—Mr. F. Smallpeice, clerk, 138 High-street, Guildford.

The Surveyor

And Municipal and County Engineer.

Vol. XLVII. JUNE 4, 1915. No. 1,220.

Minutes of Proceedings.

New Streets and Buildings.

In connection with the powers referred to in sec. 157 of the Public Health Act, 1875, of making by-laws with respect to new streets and buildings, there have been many cases, some of them quite recent, in which the courts have been asked to decide whether or no, in particular circumstances, a street or a building was "new." To deal first with streets, in *Robinson* v. *Local Board of Barton Eccles*, 1882, 21 Ch.D., 621, the Court of Appeal held that the words "new streets" are not confined to streets which are constructed for the first time out of grass-land or other vacant land, but apply also to an old country road in the neighbourhood of a town which, by the building of houses on each side of it, has recently become, or is gradually becoming, a street in the popular sense of the term, though it was previously a "street within the meaning of the definition contained in the Act. This decision was affirmed by the House of Lords (8 A.C., 798), when Lord Chancellor Selborne said ". . . and in the natural and popular sense of the word 'street,' or the words 'new street,' I should certainly understand a roadway with buildings on each side (it is not necessary to say how far they must, or may be, continuous or discontinuous), and by 'new street,' a place which before had not that character, but which, by the construction of buildings on each side, or possibly on one side, has acquired it." It is a curious thing that most codes of by-laws speak of "laying out" a new street, whereas the word used in sec. 157 is "construction." This distinction is important, for it was held in *Attorney-General* v. *Dorin* (1912), 1 Ch., 369, that the by-laws contemplate something in the nature of a physical as distinguished from a mere metaphorical laying out of a new street, and that consequently, where a defendant had done nothing to the road or its boundaries beyond making the communications between it and his houses and draining his houses into the road, he had not thereby laid out the road as a new street within the meaning of the by-laws.

In answering the question "What is a new building?" considerable assistance may be derived from the statute itself. It is enacted by sec. 159 of the Act of 1875 that, for the purposes of the Act, the re-erecting of any building pulled down to or below the ground floor, or of any frame building of which only the framework is left down to the ground floor, or the conversion into a dwelling-house of any building not originally constructed for human habitation, or the conversion into more than one dwelling-house of a building originally constructed as one dwelling-house only, shall be considered the erection of a new building. This definition is extended by sec. 23 of the Public Health Acts (Amendment) Act, which is only in force, however, in those districts to which it has been applied by order of the Local Government Board. Apart from the express provisions of these sections, it is a question of [illegible] building [illegible] 1884; 48 J.P., 725). Where an old building, not originally constructed for human habitation, is altered by some structural alteration and converted into a dwelling-house, it is as if the person who makes the alteration has built a new dwelling-house, using for the purpose the old materials—that is, the existing building—as well as some new materials, and the whole building so altered is to be treated as a new building—namely, a newly erected dwelling-house. Where, therefore, the owner of a building, which was not originally constructed for human habitation, converted it by structural alterations into a dwelling-house, and the building did not comply with the by-laws, it was held that, under a by-law authorising the council to demolish work erected in contravention of such by-laws, the urban council had power to pull down the *whole* building, and not merely the actual work of conversion (*Hanrahan* v. *Leigh-on-Sea Urban District Council*, 1909, 1 K.B., 263). This case was followed in *James* v. *Tudor* (1912), 11 L.G.R., 452, in which the appellant had for some three years occupied and used as a dwelling-house two vans, one as a bedroom and the other as a living-room. He then built a dwarf wall and placed the vans side by side so that one of them rested on it, and cut out the side of one of the vans so as to build a brick chimney stack in the opening so made. It was held that this was the conversion into a dwelling-house of a building not originally constructed for human habitation. Another case [illegible] (1914), 12 L.G.R., 844. There the respondents pulled down part of an old public-house, and deposited plans for rebuilding this part only. It was held that, upon the true construction of [illegible] the old part and the new—was to be deemed a new building, and therefore the respondents were bound to send to the local authority notice as to, and plans and sections of, the whole building.

Subsidence Problems.

The meeting at Northwich, held by the North-Western District of the Institution of Municipal and County Engineers, once again brought out the variety of the municipal engineer's work, and incidentally the difficult and unusual problems with which he may have to deal. The difficulties met with in Northwich are fortunately somewhat unique, and arise from the subsidences caused by the pumping of brine by the Salt Union. These subsidences are so frequent and do so much damage to property that Parliament in 1896 established a Salt Compensation Board to deal with claims for damage from owners of private property. This board is representative of all the parties affected, and has the power to levy a rate of 3d. per 1,000 gallons of brine pumped. While, however, compensation is given [illegible]

private property, the local governing bodies and public statutory companies get no benefit from the Act. What a serious matter to the local authorities and the public companies this is is seen from the damage done to the roads, sewers, and water and gas mains. One of the roads subsided for a length of 250 ft., and in places to a depth of 7 ft. 9 in. Sewers are found drawn out of their sockets, and, as may well be imagined, are simply crushed to pieces. The waste of water has at times been gauged to be equal to 50 per cent, while the gas mains have a loss of 30 per cent due to the same cause. Buildings have frequently had to be jacked up after settlement, and special precautions, rarely found outside an earthquake area, have to be adopted in their construction. The building by-laws of the council permit frame buildings, and steel or reinforced concrete has been found very suitable for the district. If any person proposes to build a house of unsuitable materials the Salt Union officials can object, and their valuers can take it into consideration when fixing the amount of the damage.

During the discussion of the paper by Mr. Brooke, various points as to the use of special pipes and jointing materials for dealing with such an abnormal state of affairs were raised. No very serious attempt appears to have been made to provide non-rigid joints for sewer or drain pipes, or for adopting more durable or elastic materials than the ordinary earthenware or stoneware pipe with cement joints. In the case of sewers or drains falling 6 ft. or 7 ft. there is probably no practical known method or material which would prevent breakage and collapse. There are, however, many smaller subsidences, where a bituminous or other elastic joint would avoid breakage and leakage. In some colliery districts cast-iron or steel pipes are largely used, or where earthenware pipes are used they are encased in concrete, and at times framed in with stout timber, bound round with iron, or dogged together. For water and gas, steel pipes in such a district will not only possess greater tensile strength and resist shock better than cast iron, but expansion joints will afford much greater safety than the ordinary socketed or flanged joints. The district council are to be congratulated on making such a brave fight against the unkind rebuffs they have received from so many quarters. They had their water supply polluted by the wastes from the chemical industries, and had to go 9 miles further afield to obtain a pipe supply at a cost of £70,000. Then after meeting all the requirements of the Local Government Board with regard to their sewerage and sewage disposal scheme, at a cost of £25,000, they were, within eight years of the board's approval, required to spend another £4,300 to alter the tanks so as to bring them in accordance with the recommendations of the Royal Commission on Sewage Disposal. Public baths rendered unsafe by subsidence are being replaced at a cost of £15,000. A library and museum suffered so much that it had to be demolished. Fortunately the town has always had generous donors among its leading business men, and Sir John Brunner has not only provided another library and museum, but has also built a secondary school at a cost of £15,000. Sir Joseph Verdin, too, has erected and equipped a technical school and gymnasium at a cost of £13,000, and a relative has presented a park and a hospital to the town. The housing of the working classes has not been overlooked, for the council propose to erect thirty-one cottages—twenty-one with three bedrooms and eleven with two bedrooms—as soon as the war and the Local Government Board will permit them to raise a loan for the purpose. A town planning scheme is to be prepared, and this is to include a portion of the adjoining rural area. With the completion of the local sewerage scheme the town can look forward to increased prosperity, for the salt-water bathing has in recent years given it a high standing among our inland health resorts.

* * *

The Value of Mechanical Filters.

The mechanical filter is frequently credited with powers which, taken by itself, it does not possess. Speaking generally it is only an important part of a system which includes preliminary treatment and sometimes after-treatment, without which the good results obtained by the whole complete system would be practically impossible. There is no need for any obscurity, neither is it to the advantage of anyone, including the manufacturer, that there should be any secret about the process. No filter and no system can be safely installed to purify water until the exact quality of that water is known, and the special conditions of each case will decide the details of the work. Such work can only be dealt with properly by the expert. In this respect, as is well known, the manufacturer of mechanical filters brings expert knowledge to bear upon the case, and the result is generally that the water has to be treated chemically. There should be no misunderstanding upon this point. In mechanical filtration coagulation and sometimes sterilisation do quite as much of the work as the filter. As we have before now pointed out in these pages, there is at first sight little difference between the mechanical filter (which is sometimes a concrete tank, say 50 ft. by 20 ft., filled with, say, 30 in. depth of sand, resting on 12 in. of ground), and an ordinary slow sand filter. The real difference is in the fact that with the mechanical filter facilities are provided for regular and perfect mechanical cleaning, the filtration takes place under greater water pressure, with sand of finer grade, and the water receives careful preliminary treatment to fit it for filtration, and if necessary after-treatment is given to kill the germs which even the finer sand cannot absolutely remove.

We deal elsewhere in these pages with an important paper upon "The Value of Mechanical Filters in the Purification of Water," read by Dr. Thomas Orr, the medical officer of health for Shrewsbury, at the meeting of the Royal Sanitary Institute held in that town last Friday. It is, perhaps, to be regretted that the author confined his remarks to works in this country, seeing that in America so much attention is being given to this subject. However, our own works are now of such magnitude, excellence and importance that the author was quite justified in ignoring American practice for the time being if he wished to do so. We question whether the five headings under which the efficiency of filters is dealt with are sufficient. For instance, if the plumbo-solvent action is included, the ferro-solvent action—one of great importance to the engineer, though of less importance to the medical officer—might well be included. One comprehensive heading for efficiency might even be applied—viz., the presence of any objectionable quality, positive or negative; for by means of these modern processes water becomes a manufactured product, and can be produced of any quality required.

Dr. Orr does good service in emphasising the fact that there is a serious source of fallacy in speaking of the bacteria in the filtered water as so much per cent purification. It may sound very satisfactory, for instance, to hear that the elimination of bacteria is 94 per cent. We are told that the water of the service may contain anything from 143 bacteria per c.c. to 9,920 per c.c., according to the season of the year. In this case, 94 per cent purification would result in the presence of 8 bacteria per c.c. in one case, and 590 per c.c. in the other. Thus the percentage reduction gives no indication of the actual purity of the water, which must be judged by the results of an examination showing whether the number of organisms

present a check on the reputed standard. The record of the sterilisation of the Shoeburyness water by means of Chlorox is particularly interesting, showing a further advance against the efficiency of hypochlorite treatment. The evidence brought forward by the author proving the lower capital outlay and lower maintenance cost of the mechanical filter over the slow sand filter is also of special interest. There are other points in this valuable paper and in the discussion which followed it which will be dealt with in a subsequent issue.

Scientific Investigation and Sewage Disposal.

Much has been said and written more than once in the past few years on the need for further investigation on scientific lines into the possibilities of various methods of sewage treatment. Now that the Royal Commission on Sewage Disposal has issued its Final Report, all work of this kind will be left to private initiative or to the spasmodic efforts of local authorities, and with two or three notable exceptions nothing will be done. This is unfortunate, particularly in connection with the latest developments in the aeration of sewage on the lines introduced by Dr. C. J. Fowler and Messrs. Ardern and Lockett, as the results already obtained in a small way suggest great possibilities. The importance of this new method is, however, fully recognised in the United States, where it is being tried in a number of places, the latest being at Baltimore, where the United States Public Health Service are co-operating with the Baltimore Sewerage Commission in carrying out some elaborate experiments to ascertain the best method of putting the system into operation on practical lines. On another page we print an extract from an article by the joint engineers for this work which appeared in the *Engineering Record* of April 24th, where the proposed experiments are described and the co-operation of all other workers in the same field is invited by means of suggestions and criticisms. So far as we can judge, this invitation is extended to their fellow-countrymen alone, but the results will doubtless be published in due course, and while they will have derived benefit from the initial investigations carried out by the British scientists mentioned above, we may hope to reciprocate advantage from their further experiments at Baltimore. At the same time, it appears to us that the method of co-operation between the State and municipal authorities, which has been adopted at Baltimore, is one which might be arranged here with great advantage, although it is probable useless to expect anything to be done, especially under present conditions.

It will be noted that the main object of the Baltimore experiments is to ascertain in what manner the "activated sludge" process can be carried out on the continuous flow system. This is of prime importance, as the experiments which gave such good results at Manchester and Salford were, we believe, all conducted upon the intermittent, or "fill and draw" system, which has the defects which are set out in the article printed elsewhere in this issue. The various points to be determined by these experiments, as described in the same article, cover almost every detail that can be thought of at the moment, but in the figures which will be given as to construction and operation costs it will be advisable for us in this country to confine our attention to the results per unit of population if we wish to use them as the basis for the design of works here, as American sewage is, as a rule, so much more highly diluted than ordinary sewage in English towns. Another point which is not mentioned, but may already be in the minds of those who are arranging the experiments, is the question as to the most suitable depth of the tank in which the sewage is aërated. The rate at which the air passes up through the sewage is regarded as [illegible] to need a considerable depth, as [illegible] the whole of the available oxygen is [illegible] from the air in its final passage to the [illegible] the liquid. The utilisation to the utmost of the air will be an important factor in reducing the operating costs to the minimum. In this connection the use of plates, or other forms of horizontal air baffles, somewhat on the lines of the horizontal layers of slate slabs as used in the Massachusetts experiments at St. Lawrence, will probably be considered.

Scavenging in Urban Districts.

The investigations which have been made under the direction of the Local Government Board into the carriage of infection by flies have led to a realisation by the authorities of the special danger to health of these insects in the abnormal time through which we are passing. The only effective way to deal with the trouble is to attack it at the source—that is to say at the breeding-place. It is now established beyond controversy that the accumulation of refuse in the neighbourhood of dwellings, which is usually a consequence of the use of fixed ashpits, is objectionable not only because of the effluvium nuisances which it tends to create, but also because of the opportunities afforded for the retention of infective material and for the breeding of flies and other pests. This is clearly pointed out in the memorandum which has just been issued by the board as an introduction to a return as to scavenging in urban districts in England and Wales. Quoting from a former report the memorandum explains that the exact share borne by flies in conveying the infection of epidemic diarrhœa cannot yet be stated. It would be a mistake, with our present knowledge, to assume that the problem of the prevention of this disease is limited to the destruction of flies. It is concerned also with the personal cleanliness of the mother who has to prepare the infant's food and with the cleanliness of the house, the back-yard, the court, and the street, from which infective material may obtain access to the infant's food, with or without the intermediation of flies. For practical purposes, however, the number of flies in the summer months may be regarded in some [illegible] index, under present conditions, of the possibilities of contamination of food by pathogenic microbes or by decomposing organic matter, especially in districts in which privies and pail closets persist, and in which accumulations of house refuse or stable refuse are permitted.

Both the memorandum and return are largely concerned with emphasising the unsatisfactory nature of the old method of storing house refuse in fixed ashpits as compared with the movable receptacle of galvanised iron. The latter permits the refuse to be thrown direct into the cart, and is necessarily so limited in size as to require emptying at frequent intervals. Moreover, if it is of a proper type, with a tight-fitting cover, the activities of the fly are restricted, and disinfection is a simple matter. From a summary of the return, which will be found in another column, it will be seen that only 11 per cent of the urban districts of England and Wales are at present furnished with the most sanitary type of receptacle for the storage of house refuse, while 54 per cent still have a considerable number of fixed ashpits. The remaining 35 per cent belong to the intermediate class, which have uncovered, movable receptacles of a miscellaneous character which, while admitting of frequent removal of the refuse, are open to objections which do not apply to the sanitary bin. This in itself affords ample justification for drawing attention to the matter with a view, where possible, to securing the substitution of the sanitary bin for the insanitary ashpit or open, movable receptacle.

Scavenging in Urban Districts.

A LOCAL GOVERNMENT BOARD RETURN.

The Local Government Board have issued to Metropolitan borough, town and urban district councils, and medical officers of health, copies of a return as to scavenging in urban districts in England and Wales which has been compiled from the schedules furnished by the authorities of those districts at the beginning of 1914. The return shows in the appendix what are the arrangements for the storage, collection and disposal of refuse in each urban district, while the preliminary memorandum indicates in what respects defective arrangements may prejudice public health, and how these arrangements may be improved.

The board trusts that councils will take into consideration at an early date the question whether any alteration is required in the present arrangements for storing, collecting and disposing of refuse in their districts, and will endeavour to effect any improvement which may be necessary before the hot weather sets in. They point out that it is especially desirable at the present time, when so many districts are congested with troops and refugees, and when there are peculiar dangers of the spread of infectious disease, that sanitary authorities should do all that is in their power to prevent the retention of accumulations of refuse in the neighbourhood of dwellings, and generally to maintain an efficient service for dealing with house refuse. In particular, the board suggest that authorities should consider whether all or any of the following steps are necessary in regard to their districts:

(1) To require a sanitary bin to be provided in connection with all new houses and buildings.

(2) To encourage owners and occupiers of existing houses to provide covered sanitary bins in place of other refuse receptacles.

(3) To undertake with their own staff the scavenging in the populated parts of their district, and to remove all refuse from these parts in properly covered carts at least once a week, especially during the summer.

(4) Where no destructor is available, to avoid sending refuse out of the district in such a manner as to cause nuisance and danger to health, and where tips are used to secure that they are as remote as possible from dwellings, and that the refuse is covered with earth and the tip fenced in.

It appears that only 11 per cent of the urban districts of England and Wales are at present furnished with the most sanitary type of receptacle for the storage of house refuse, while 54 per cent still have a considerable number of fixed ashpits. The remaining 35 per cent belong to the intermediate class which have uncovered movable receptacles of a miscellaneous character, wooden boxes, tubs, &c., which, while admitting of frequent removal of the refuse, are open to objections which do not apply to the sanitary bin. Among the 611 ashpit towns, however, there are 49 which have less than 10 per cent of fixed receptacles, 81 more with 10 to 20 per cent, and another 138 with between 20 and 50 per cent. 312 districts must be classed as having ashpits as their prevailing type of receptacle; for the remaining 31 the figures cannot be given.

A table in the report shows that a great many districts are replacing ashpits by galvanised-iron bins. In the case of 431 of the 611 towns with ashpits, the conversions that have been made to sanitary bins during recent years suggest that the authorities are making an effort to rid themselves of the more insanitary types of receptacle. In the other 180 districts the number of conversions is not given, or appears to have been very small. In respect of 59 there is practically no information; in 121 no active steps are being taken to substitute bins for ashpits.

The report points out that the difficulties which are sometimes associated with the improvement of existing property do not apply to new houses, and that there is no reason why any urban authority should fail to secure that every new house erected in its district should be provided with a galvanised-iron bin with a proper cover.

A further table shows that in 36·9 per cent of the urban districts no definite stipulation is generally made as to the type of receptacle to be provided in connection with new buildings, but that in some cases bins are usually provided.

Another table in the report shows the arrangements made for the removal of refuse in the urban districts of various classes.

In about 5 per cent of the districts only is the work left either wholly or chiefly in the hands of the occupiers of premises. In about 66 per cent of the districts the removal of refuse is carried out, in the main, by the council's own staff, horses and carts, while in about 10 per cent a contractor either scavenges a part of the district or provides horses or carts for the use of the council's staff. The work is carried out wholly by one or more contractors in about 19 per cent of the urban areas.

The opinion is expressed that scavenging, when performed by a contractor, is frequently not so efficiently carried out as when the council's own staff do the work. It is admitted, however, that all depends on the supervision exercised by the council and its officials.

An important matter affecting the efficiency with which scavenging is performed is, of course, the type of cart employed. In 63 per cent of urban districts refuse is removed in covered carts, or if open carts are used they are covered with waterproof sheets when full, while in 7 per cent both covered and open carts are used. In 30 per cent of the districts, however, open carts only are employed. It is pointed out that this must result, in windy weather, in the scattering of refuse and paper while it is being transferred from the receptacle to the cart, and while it is being carried away for disposal. In addition, dust, which may contain infective matter dangerous to the public health, is liable to be blown about.

In 35 per cent of the urban districts it is the practice during the process of removal to deposit the refuse from some of the fixed receptacles on the surface of yards or streets. In addition, in many of the districts containing fixed receptacles the emptying is carried out at night-time, and, in the uncertain light, thorough cleansing of yard surfaces and pavements is impracticable. These conditions, it is remarked, constitute a serious danger to the public health, especially where wet ashpits are concerned. Filth containing infective matter may be carried from the yards into houses on footgear, and, in addition, the dry refuse must be blown about by the wind and conveyed into dwellings, thus contaminating food and drink.

CESSPOOLS.

The opportunity was taken to obtain the number of cesspools receiving sewage in each urban district, and the results are printed in regard to all districts in which there were thirty or more cesspools, with a statement whether the cesspools are emptied by the council or not. There were, it is shown, 182 such towns among the 1,129 urban districts; but on comparing the number of cesspools in each case with the number of houses in the district according to the census reports, it appears that, as a rule, the cesspools merely serve outlying houses, the chief part of the district being provided with sewers. The exceptions, in which the number of cesspools is 25 per cent or more, include 3 of the 144 smaller towns, 8 of the 482 towns with populations of 5,000 to 20,000, and 22 of the 107 towns with populations under 5,000. As a rule these are the towns in which the water-carriage system prevails much in excess of the sewerage provision, but cesspools are sometimes employed for the purpose of keeping back solids from entering imperfectly constructed sewers, the liquid contents only overflowing to the sewer. There are other urban districts insufficiently provided with sewers in which closets are, in the main, on the conservancy system, and slop water is thrown on to the ground. In some districts cesspools are in use for the collection of slop water only. In a cesspool district, the board observe, the chief respect in which the public health is threatened is the danger of the contents of the cesspool (which is rarely watertight) polluting a neighbouring water supply. This risk is, of course, removed where the water supply is piped to all the houses in the district from a distant source. The remaining disadvantages of the cesspool system are the nuisances and difficulties caused by overflows and by emptying the cesspool and disposing of the contents.

DISPOSAL OF REFUSE.

The satisfactory disposal of refuse (the report proceeds) creates very difficult problems, especially in

[illegible] the larger [illegible] From the point of view [illegible] the [illegible] satisfactory solution [illegible] [illegible] [illegible]

e.g., establishment and loan charges may be included or excluded, and credit may or may not be taken for steam or clinker sold to other departments or the council. Moreover, in health resorts, such as Southport, Blackpool and Leamington, the cost per head of the estimated population is hardly a fair criterion, since that population is sometimes enormously increased in the season, and in such places there is generally a much more frequent collection of refuse, especially from hotels and boarding houses. Subject to these considerations, the board think it may be said that the cost of collection is least in districts with movable receptacles, and the cost of disposal greatest, though not largely or uniformly greatest, in districts where most of the refuse is sent to a destructor.

LONDON.

In the report London is included among the towns in which 95 per cent or more of the refuse receptacles are covered galvanised bins. There are no wet ashpits in London, but some of the twenty-nine Metropolitan boroughs still contain dry ashpits.

In six boroughs—Bermondsey, Bethnal Green, Greenwich, Poplar, Shoreditch and Stoke Newington—though practically all the receptacles are of a movable character, there are some uncovered bins in use. Covered galvanised-iron bins are required in connection with new houses in all boroughs except Bermondsey, Bethnal Green, Kensington and Poplar.

COLLECTION OF REFUSE.

Refuse is collected by the borough council's own men throughout all but nine districts. In Hackney, Holborn, Saint Marylebone, Stoke Newington and Wandsworth it is entirely done by contract; in Chelsea, Lambeth, Paddington and Woolwich partly by contract and partly by the council.

Under the by-laws made by the London County Council under sec. 16 (2) of the Public Health (London) Act, 1891, house refuse must be collected in all districts at least once every week. These by-laws do not apply to the City of London, in which house refuse is collected daily.

Covered carts are used in all the boroughs. In Paddington only is there any emptying of refuse into yards in the course of removal; in this district, it is stated, some of the bins are too heavy to carry.

DISPOSAL OF REFUSE.

Twenty-five Metropolitan boroughs send their refuse out of the district; fourteen out of the total number of twenty-nine possess destructors. Two—Poplar and Woolwich—dispose of a small proportion of their refuse, 15 and 6 per cent respectively, on tips situated within their boundaries.

An Engineer's Will.—Mr. R. E. W. Berrington, M.Inst.C.E., of Wolverhampton, a well-known authority on water supplies, and a former mayor of the borough, who died on January 24th, left £20,796.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

Society of Architects: South African Branch.—On account of the activities of the society's branch at Johannesburg being restricted during the war and there being less need of funds for general purposes, it has been decided to vote the money usually expended on social functions and visits to works to the relief of distress. The branch has voted a contribution of £25 to the Governor-General's Fund for the relief of distress caused by the war, and has also sent a sum of ten guineas to the funds of the Professional Employment Committee of the Architects' War Committee. The council of the branch also report that the South African School of Mines and Technology has accepted the offer of the South African Branch of the Society of Architects to give prizes of a total value of ten guineas to members of the architectural classes at the school, in the subjects of architectural history and student's class work.

* "A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law. A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

EXPERIMENTAL ROAD CONSTRUCTION IN SCOTLAND.

ROAD BOARD REPORT.

Particulars of the experimental work with various road materials and methods of construction which has been carried out by several county councils in Scotland, under arrangement with the Road Board, have now been issued in the form of a report or memorandum.

The object which the Road Board had in view in arranging for these trials was to secure a test under service conditions somewhat upon the lines of the Sidcup experiments carried out in 1911, of a series of trial lengths of road construction laid down under the general direction and supervision of the board. This series, comprising eight different forms of construction, has been laid down in eight districts, where conditions of traffic, subsoil, &c., are reasonably similar. Records of results obtained are being collected and collated by the board, in more complete manner than is generally obtainable in the case of road surfaces laid down in the ordinary course of road maintenance in different parts of the country.

The various lengths are being carefully watched, and measurements of wear taken at intervals. Complete records are being kept of weather, of conditions of the road surfaces under test, and the expenditure required to maintain them in good order.

The results obtained will be embodied in supplementary reports issued from time to time in the expectation that they will prove of great value to road engineers.

Tests are being made with eight forms of construction, of a nature which might apply to a very large area of the Scottish roads—covering practically all the county roads—and these are fully described in the report recently issued. They are:—

(1) Ordinary water-bound macadam.

(2) Ordinary water-bound macadam, surface-sealed with distilled tar.

(3) Macadam, 3 in. thick, grouted with a mixture of pitch and sand.

(4) Macadam, 3 in. thick, grouted with pitch alone.

(5) Macadam, 3 in. thick, grouted with a mixture of Trinidad asphalt and distilled tar.

(6) Ordinary tar-macadam—*i.e.*, tarred whinstone metal surface-sealed with distilled tar.

(7) Tar-macadam—*i.e.*, whinstone metal with a binding mixture of Trinidad asphalt and distilled tar.

(8) Ordinary tar-macadam, surface-sealed with a prepared Mexican bituminous mixture.

The roads selected are what may be termed "main" or "through" county roads. They average about 18 ft. in width, and have previously been maintained at an annual cost of about £75.

The report (which is published at 2s., post free 2s. 3d., by Messrs. Morrison & Gibb, Tanfield, Edinburgh) includes specifications of the forms of construction adopted, petrological description and physical tests of the stone used, complete tabulated records of the nature of subsoils and foundations, widths of roads, gradients and crossfalls, footpaths, hedges and overhanging trees, actual costs in detail of laying each section, previous maintenance costs, traffic tonnage, &c., together with example charts of measurements being taken, meteorological observations, record of surface conditions of the test lengths, and the forms upon which monthly maintenance costs are returned.

Inasmuch as the work was completed only in November last, no deductions can yet be drawn as the result of the experiments. At the same time the report contains sufficient of interest to commend it to road engineers everywhere. Indeed, the object of the present report has been to record all the conditions obtaining at the commencement and during the construction of this work; and a thorough knowledge of these conditions will be helpful and, in fact, necessary to a full appreciation of the results obtained, as set forth in the supplementary reports when these are issued.

Waterproofed Cement Concrete.—The surveyor for the Farcett schools reports that he used waterproofed cement concrete on flats over corridors in these schools, and speaks highly of the result. He is now about to build a large concrete reservoir, which will also be treated with the cement-waterproofing powder Pudlo.

ACTIVATED SLUDGE EXPERIMENTS AT BALTIMORE.

E. L. [illegible] C. FRANK,
Sanitary Engineer, Baltimore Bureau of Public Health, Sewerage Commission, Baltimore, Md.
and
CALVIN W. HENDRICK,
Chief Engineer, Sewerage Commission.

[illegible] experiments [illegible] what is termed the "activated sludge process" of sewage purification, have been reviewed recently in the American engineering Press. The importance of translating this process from the [illegible] possible [illegible] reducing the cost of operation, by this and other improvements, into the region of workable values, is obvious. The fill-and-draw method, as applied to the activated sludge process, (*a*) consumes an amount of hydraulic head equivalent to the difference between the full and empty water levels; (*b*) produces a low operation efficiency because the filling, oxidation, settling and [illegible] upon each other; (*c*) necessitates periods of non-oxidation which possibly reduce the efficiency of the activated sludge.

PRINCIPLES OF TANK DESIGN.

In an attempt to overcome these difficulties a type of continuous-flow tank, termed the aero tank, was developed in December, 1914, at the Hygienic Laboratory of the United States Public Health Service. The considerations underlying this design are as follows:

(1) The oxidation process is promoted by the degree of fineness of the air or oxygen bubbles introduced into the oxidation chamber.

(2) The oxidation process is promoted by the degree of agitation of the contents of the oxidation chamber, this agitation keeping the particles of activated sludge suspended in the liquid. Agitation may be effected (*a*) by the impact of the inflowing sewage, (*b*) as a secondary function of the oxygen introduction device, or (*c*) as a primary function of special agitators—*e.g.*, some propelling device enclosed, if desired, in a pipe to increase the radius of agitation.

(3) The activated sludge depositing in the settling chamber should be returned continuously into the oxidation chamber, both in order to prevent the depletion of the activated sludge in the oxidation chamber, and to prevent secondary reactions of the activated sludge in the settling chamber.

(4) The passage of oxidation chamber contents into the settling chamber should be effected in such a way as not to hinder the return of the sludge particles into the oxidation chamber.

A tank, therefore, to answer the above requirements may be designed to consist of an oxidation chamber, into which the sewage is continuously introduced, and [illegible] oxygen in a finely divided state and being agitated; a settling chamber, whose inner surfaces are so inclined as to prevent the accumulation of solids; a communicating passage to effect the transfer of oxidation chamber contents into the settling chamber without hindering the return of sludge particles; a communicating passage between the lowest portion of the settling chamber and the oxidation chamber.

Inasmuch as Imhoff tanks, such as those nearing completion for the city of Baltimore, may easily be converted for the above process, the Public Health Service and the Baltimore Sewerage Commission have agreed to make joint experiments for the purpose of testing on a large engineering scale the basic principle of the tank, so as to develop all possible defects and improvements.

SCHEDULE OF EXPERIMENTS.

The proposed schedule of experiments includes the determination of—

(1) The best method of introducing the sewage into the oxidation chamber.

(2) The best method of comminuting air in water.

(3) The best method of agitating the contents of the oxidation chamber.

(4) The optimum period of detention in the oxidation chamber.

(5) The best method of effecting passage from the oxidation chamber into the settling chamber.

(6) The optimum period of detention in the settling chamber.

(7) The characteristics of the oxidised and settled effluent.

(8) The amount of air necessary per unit of sewage.

(9) The best method of sludge withdrawal, and subsequent sludge treatment or utilisation.

(10) The characteristics of activated sludge.

(11) The best manner of initial activated sludge formation.

(12) Possible remedies for defects that may develop in the course of experiment.

(13) An estimate of construction costs per unit of population and per unit of sewage flow.

(14) An estimate of operation costs per year per unit of population and per unit of sewage flow.

This article is written primarily to induce co-operation. Undoubtedly a number of experimenters in the United States have become interested in the apparent possibilities of the activated sludge process, and unnecessary duplications of effort may be avoided if free communication be established between such experimenters. The authors hereby invite co-operative suggestions and exchange of results under the following conditions:—

All communications should be in writing, and addressed to either of the authors.

All communications will be acknowledged.

The periodic exchange of results will be undertaken with those actively engaged in this line of research.

Such suggestions from outside sources as are found in the experiments at the Baltimore plant to prove important modifications or additions to the basic principle are to form material which may be used, if desired, for patents free to the people of the United States, due acknowledgment being given the authors of such suggestions.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Is there not some truth in the statement "that it is an ill wind that blows nobody any good," when it is considered that the London tramway strike gave to the occupants of houses along the lines of the tramway routes a period of quiet from noise that they have not enjoyed for many years past? Did not also the cessation of tramway traffic bring "grist to the mill" of some of the underground tubes and railways? But what do our enemies think of all these strikes?

* * * *

Is it a fact, as stated in the *Salmon and Trout Magazine* of April, that washings from old bituminous-bound roads are as dangerous to fish as are supposed to be those from newly tarred roads? Are not the experiments detailed in the above magazine well worth the perusal of those who are interested in the subject, it being shown that it is some form of phenol which is dangerous to fish life, and that even in refined tars there are poisons which are dangerous until the tars are set; that even then they are easily broken up, and, being soluble, are a dangerous menace to fish life? Would the remedies suggested—viz., sedimentation in settling pits, percolation over or through soil, or maintenance of a sound waterproof surface—be sufficient? Is not the last-mentioned consummation what all road engineers are aiming at?

* * * *

Is it not a fact that a leading engineering institution still has in prominent positions members who are of enemy alien birth? And would it not be interesting to know what steps are being taken to prevent these men from appearing at meetings where they are not wanted after the crimes their countrymen have committed? Could not the institution in question take an example from the Royal Automobile Club, who have issued the following circular to their members?—

NATURALISED BRITISH SUBJECTS.

I am instructed to inform you that a Meeting of the Committee of the Club was held on the 12th inst. to consider the question of the use of the Club during the War by naturalised British subjects of alien enemy birth, either as Members or as Guests, when the following Resolution was passed unanimously: "That in view of recent events and the consequent state of public opinion, the Committee considers it imperative that no person who, although naturalised, is of German, Austrian, Hungarian or Turkish birth, should use the Club during the continuance of the War either as a Member or as a Guest." The above Resolution was passed, in the interests of the whole membership, in order to avoid friction and unpleasant incidents which might otherwise occur. While the Committee fully realises that there are many naturalised British subjects of alien enemy birth who are loyal to this country, it also feels that this is not a time when discrimination can be exercised. *ALL* Members of the Club are asked in their own interests loyally to support the Committee and abide by the terms of the Resolution until the War is over.

* * * *

Is it a fact that during the recent Zeppelin raid at Wallsend, Blythe, and other towns on the North-East Coast, several fires which were produced by the bombs were immediately quenched by means of hand extinguishers? And if this is so, should it not cause a boom in this description of appliance?

Institution of Municipal and County Engineers.

NORTH-WESTERN DISTRICT MEETING AT NORTHWICH.

In the unavoidable absence of the district chairman, Mr. J. S. Brodie, Mr. C. Brownridge (Birkenhead) presided at the North-Western District meeting of the Institution of Municipal and County Engineers which took place last Saturday at Northwich, Cheshire. The attendance was by no means a large one, but the proceedings were altogether successful. The municipal works of the town were described in a short paper which the engineer and surveyor to the urban district council submitted to the meeting, and an excellent discussion was followed by an interesting round of visits. Those present included Messrs. A. J. Price (Lytham), A. B. Statham (Salford), N. A. Alker (Chorley), W. W. Whyatt (Whitchurch), N. W. Sowden (Whitchurch), F. Wilkinson (Prestatyn), R. C. Cordon (Knutsford), A. M. Ker (Warrington), A. W. Bradley (St. Helens), hon. district secretary, J. Brooke (Northwich), J. A. Settle (Bury), J. A. Brentnall (Northwich), Ward (Northwich), and J. A. Cowley (Northwich).

Assembling at the council offices, the members were received on behalf of the local authority by the clerk, Mr. J. A. Cowley, both the chairman and vice-chairman of the council having been prevented from being present. Mr. Cowley remarked that Northwich had little to commend it in the way of beauty, but they were trying to improve it. He thought they would find in it buildings which would compare with some of those in towns of larger populations, and they were endeavouring to combat the evils of subsidence caused by the brine pumping that went on there, and put up buildings that would be a credit to the town. The statistics in Mr. Brooke's paper provided some evidence of the progress they were making, and he believed there were in the district some points of interest and novelty which they would not find in any other town in the country, and if it was only regarded as a little relaxation from their very arduous duties he was sure their visit would not be regretted by them.

The Chairman, in returning thanks, spoke of the educational value of the institution meetings. The duties of the engineer and surveyor to any local authority were so varied that it was necessary for them to go afield in order to see examples of all classes and types of work. Northwich was a portion of the country they had not previously had the privilege of visiting, and he was sure that they would gather during their stay there some information from which they could profit. The paper which Mr. Brooke was about to submit showed that in that gentleman the Northwich council had a most excellent official.

NORTHWICH MUNICIPAL WORKS.

By J. Brooke,

Surveyor to the Urban District Council.

Northwich has for centuries been famous as one of the principal salt manufacturing centres of the world. The Romans are known to have engaged in the trade in the town.

The manufacture of chemicals, as an allied industry, now employs some 5,000 to 6,000 men, and the river Weaver (one of the finest inland navigations of the country) forms the connecting link with the Mersey, where the products are shipped in ocean-going vessels.

The urban district of Northwich was constituted in the year 1875. It has an area of 1,758 acres, and an estimated population of 19,000. Assessable value, £70,000; district rate, 3s. 4d. in the £ per annum; poor-rate, 3s. 2d. in the £ per annum; death-rate from seven principal zymotic diseases, 1·5; death-rate, 14·4; birth-rate, 26·0.

WATER SUPPLY.

The Northwich Local Board acquired the undertaking of the Northwich Waterworks Company, under the Northwich Local Board Act, 1885. The sources of supply at that time were Wade Brook and wells, in the Castle district, but both sources are now only used for trade purposes and for road and sewer purposes. The Act of 1885 authorised the acquisition of lands at Cote Brook, near Tarporley, a distance of 9 miles from Northwich, and the construction of waterworks, including the main aqueduct and a service reservoir. The amount borrowed for the acquisition of the undertaking and the construction of works was £70,000. The supply at Cote Brook is obtained from springs and boreholes, the water rising under natural pressure and gravitating to Heyeswood reservoir, about 2 miles from the town. The quantity of water delivered into the reservoir is approximately 450,000 gallons daily, and a population of 20,000 is served. Analysis of the Cote Brook water shows it as one of great purity, requiring no filtration.

The Northwich Urban District Council Act of 1914 authorised a further expenditure of £20,000 on waterworks, and the scheme provides for the acquisition of additional lands in the Cote Brook district, and the sinking of two 24-in. boreholes to a depth of 150 ft. and a reduced diameter to 300 ft.

The water from the boreholes will be raised by pumps to a reservoir within a quarter of a mile, at an altitude of 350 ft. above ordnance datum. The aqueduct will follow a different route to the town than the existing main, which passes through a subsiding area. The higher level of the new reservoir will enable the council to supply water to outside districts which cannot now be satisfactorily reached. The additional supply will also permit of a general conversion of closets to the water-carriage system, and the more general provision of baths in the smaller houses.

For the detection of waste, which is very considerable in a subsiding district, there are eighteen meters of the Siemens type, varying in size from 1 in. to 8 in., with recording apparatus, and there are 25 miles of water mains, varying from 2-in. to 15-in. diameter.

Receipts from domestic water supply		£2,813
Receipts from water by meter (trade)	...	1,816
		£4,629
Annual water supply expenditure		2,380
Gross profit for year...	... ...	£2,249
Loan charges:—		
Principal...	... £928	
Interest	1,208	
		2,136
Nett profit, year ending March 31, 1915		£113

SEWERAGE.

Previous to the year 1901 the sewage of a large area of the district discharged direct into the river Weaver, the remaining portion being treated at the Witton outfall works before discharging into Wade Brook. In the year 1901 the higher portion of the district on the west side of the Weaver, having a population of 4,500, was resewered, and new chemical precipitation outfall works were constructed at Winnington. The works were designed to eventually take the whole of the sewage of the district, in addition to a portion of the adjoining rural area. The cost of the sewers and outfall works was about £25,000.

In the year 1909 the council presented a scheme to the Local Government Board for the sewering of an additional area, embracing the low-lying part of the district, with a population of about 10,000. The board declined to sanction the work for the low-lying area on account of the impracticability of maintaining an effectual scheme, owing to the effects of subsidence of the ground caused by the pumping of brine. The major portion of the scheme was approved and the works were brought to a completion last year, the cost of sewers and pumping stations being £9,800.

The Local Government Board required an alteration to the sewage outfall works, which cost £4,300, in order to bring the works to the standard of the recommendations of the Royal Commission on Sewage Disposal. This work was required in face of the fact that the original works were constructed only eight years before, and approved by the board.

The principal features of the scheme are two pumping stations, situate on the easterly side of the river Weaver. Station No. 1 consists of two automatic electrically driven centrifugal pumps, each capable of raising 36,000 gallons of screened sewage per hour to a height of 70 ft., where it discharges into the high-level system on the westerly side of the river, and two three-throw ram pumps, driven by gas engines, each pump capable of dealing with 9,000 gallons of crude (unscreened) sewage per hour.

The No. 2 station consists of two automatic electrically driven centrifugal pumps, each capable of dealing with 10,000 gallons of screened sewage per hour, and one 6-in. electrically driven ram pump. This station raises the sewage about 10 ft., from a low to a high level sewer, which gravitates to the No. 1 pumping station. The rising main at No. 1 pumping station is constructed of 12-in. steel tubes, and passes under the river Weaver and backwater at a depth of 18 ft. below top-water level of river. A 9-in. steel tube syphon conveys sewage from a district on the westerly side of the river Weaver to the No. 1 pumping station, whence it is pumped through the rising main. The approximate length of the 12-in. rising main is 737 yds., and the 9-in. syphon 180 yds. There is a connection from the rising main to the 9-in. syphon, for the purpose of flushing the syphon.

PUBLIC CONVENIENCES.

There are eight public conveniences in the town.

ROADS AND STREETS.

There are 20 miles of roads and streets in the district. The main road carries traffic from Yorkshire and Lancashire to North Wales, and is extensively used by touring cars and commercial vehicles. The surface of the carriageway is paved with 4-in. Newry granite cubes, asphalted for the town area and tarmacadam for the semi-rural area.

The main roads of the district are so affected by subsidence from time to time that it is necessary to restore them. Varying lengths have been raised, extending to a distance of 250 yds., while the greatest depth of filling was 7 ft. 9 in. The work also involves the raising of all sewers and service mains, and the lifting of the premises on either side of the road affected. Care is always taken to allow the carrying on of business during the restoration, and this makes the work more complicated and difficult to deal with.

In the year 1893 the council adopted the Private Street Works Act, 1892, and since that date have made up fifty-eight streets, which have been adopted as public highways. The total cost of these works has exceeded £18,000. The method of apportionment has been mainly on frontage, although degree of benefit has been taken as the basis of apportionment in certain instances.

The question of the provision of a refuse destructor is now before the council, and would have matured into provision but for the intervention of the war.

HOUSING SCHEME.

The Local Government Board have approved a scheme for the erection of thirty-six houses, on 2 acres of land, under the Housing of the Working Classes Act, 1890. Twenty-one houses are provided with three bedrooms, and fifteen with two. The contract price for the erection of twenty-one three-bedroomed houses is £145 per house, and that for fifteen two-bedroomed houses is £135 per house. The cost of the land was £842.

In consequence of the war and the Treasury Order the Local Government Board (up to the present) have refused to allow the work to proceed, although negotiations are in hand with a view to enabling the council to take advantage of the favourable tender.

TOWN PLANNING.

The town planning movement led the council to take action in regard to the preparation of a town plan, embracing practically the urban district and a portion of the adjoining rural area. Differences of opinion arose between the two authorities, and the Local Government Board intervened unofficially and advised that the idea of including the portion of the rural area should proceed. No formal application has been made for sanction to prepare the town plan, but it is likely that such application will be made in the near future.

BUILDING BY-LAWS.

An unusual feature in the building by-laws of the council is that they allow the erection of composite buildings, which are easily lifted or adjusted in case of subsidence. The composition is timber framing, filled in with brickwork. The walls of the rooms are in many cases lined with tongued and grooved matchboarding, nailed to the timber diagonally; this has been found to wonderfully strengthen the building, and thus more effectually resist the effects of subsidence. The modern method of assisting the timber structure is to lay the wooded sills in steel channels, securing the corners with plates.

SALT COMPENSATION BOARD.

In the year 1896 the Salt Compensation Board was established under the Brine Pumping (Compensation for Subsidence) Provisional Order Confirmation Act, 1896. The Act constitutes a board, composed of members of the county council, the urban and rural councils, and representatives elected by the brine pumpers. Owners of private property submit claims to the board for damage in respect of the pumping of brine, and after adjudication a rate is levied on the brine pumpers, sufficient to meet the total claims in one year; the rate, however, is limited by the Act to 3d. per 1,000 gallons of brine pumped. The brine is registered by meter, but the maximum rate has never been levied. Local authorities and public statutory companies are excluded from the benefits of the Act.

In 1887, Mr. Robert Verdin, M.P., a native of the town, presented to the town, to commemorate the Queen's Jubilee, a combined gift of a public park, public baths, and a hospital, which immediately proved an immense boon to the district. Unfortunately, the baths, which were beautifully designed, on the half-timber principle, were affected by subsidence, and, after spending large sums on their repair and adjustment, the council decided to abandon them, as they became unsafe. The swimming bath was formed of iron plates, riveted together, and as the building was raised the pond was separately adjusted.

There was a feature of the baths interesting to sufferers from rheumatism, sciatica, and kindred complaints. A supply of brine was laid on, and the brine baths, which were served in the ordinary slipper baths, became a strong rival of Droitwich. The water in the swimming bath also contained a percentage of brine, bringing the density to a little over that of sea water.

New baths have been erected, and are now nearing completion, from the design of Mr. J. Ernest Franck, A.R.I.B.A., of London. I hope members will take the opportunity of inspecting the building, which, when completed, will probably cost £15,000, including the internal fittings. The swimming pond is 75 ft. by 30 ft., and is of reinforced concrete. The dressing-boxes are collapsible. There are eighteen slipper baths, fitted with fresh water and brine, and two dressing-rooms are provided for some of the baths. The council have found that much time is saved by this arrangement, especially in the case of brine bathers. Bathers come from all parts of the country, and the Northwich brine is strongly recommended by the medical profession for its curative properties, as it is the strongest brine in the world.

Northwich has been particularly fortunate in having public-spirited benefactors, for, in 1886, Sir John Brunner, Bart., presented a fully equipped library and museum to the town. Twelve years afterwards, subsidence had so affected the building that it had to be demolished, and in its place Sir John Brunner generously provided another building, erected on the half-timber principle, which is quite an architectural feature of the town.

The technical schools and gymnasium were the gift of Sir Joseph Verdin, and were erected and equipped at a cost of £13,000. This building is not erected on the composite principle, as the site is supposed to be outside the subsiding area. Quite near the technical schools, a modern secondary school has been erected by Sir John Brunner, providing accommodation for 300 scholars, at a cost of £15,000.

The council are the owners of the manorial rights, which are very ancient, and a market is held on two days of the week. The market hall was erected in 1876, on the composite principle, and contained a gallery running along the four sides of the building, on which are erected stalls for the sale of small articles. The annual profit of the markets carried to the District Fund is £340.

DISCUSSION OF MR. BROOKE'S PAPER.

The CHAIRMAN (Mr. C. Brownridge), in moving a vote of thanks to Mr. Brooke, said he wished to congratulate the latter on his most excellent summary of the works which had been carried out in Northwich. If he had to make any adverse criticism on the paper it would be rather that he did not go far enough with it. At the same time, he thought they might justly congratulate him on its concise and readable character, and to that extent the advantages outweighed the disadvantages. But he would like to ask Mr. Brooke to amplify his paper on one or two little points. It was very often forgotten when a paper was being written that it was on the little points, as a rule, where they stuck. In a town like that, which was catering so excellently as a watering-place, it was, of course, of extreme importance that

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there should be a water supply without reproach, and he should like Mr. Brooke to tell them the nature of the geological formation into which the boreholes were sunk. It would also be of great value to know the type of pump he was going to install. Northwich was, of course, justly famous for its brine baths, and it was likely to be more so in the near future. Men would be coming back from the front seriously racked by rheumatism, and places like Northwich could do much to bring them back to the full enjoyment of life. In dealing with sewage, many of them were troubled in designing sewerage systems to know what other people did in regard to making provision for rainfall, and it would be extremely valuable if they could be told what had been done there—what rainfall was provided for, and what proportion of that it was expected to get to the sewers. Of course, Northwich was somewhat exceptionally circumstanced —a novel district—and much of the rainfall might not go into the sewers. In dealing with the Local Government Board in connection with the alterations of the sewage outfall works, he noticed Mr. Brooke had had a little trouble, and perhaps he would tell them the nature of the difficulty that had arisen. In regard to roads, they had not been told the nature of the stone that Mr. Brooke used for his tar-macadam. It was a great advantage to know what various districts were doing in regard to that question. He might say at once that he used both limestone and granite, and, if anything, he had a preference for certain classes of granite; but in certain streets—and that was a great point—he preferred to make use of limestone. They heard of surveyors saying they could not make a good tar-macadam of granite, but he did not agree with that if the stuff was properly made. He was afraid they were apt to make tar-macadam on a principle which, if applied to the mixing of concrete, would be courting disaster. He was very pleased to see that Northwich had tackled the question of town planning. Differences of opinion, he observed, had arisen between the urban and rural authorities. That was a difficulty that had arisen all over the country, and it was a question whether town planning would be altogether a success until there was some sort of compulsion instituted. So he congratulated Mr. Brooke on securing the intervention of the Local Government Board and getting the rural area included. He would like to ask whether Mr. Brooke had had any experience of the use of reinforced concrete in the district, for it would be interesting to know whether that was a material that could be employed with advantage in places subject to subsidences. They knew it had been used with great success in earthquake countries, so that it was possible that it would be of value in Northwich.

Mr. A. J. Price (Lytham) seconded the vote of thanks. The paper was a short one, but it was none the worse for that. They sometimes got papers altogether too long—papers which did not contain much matter—and when they had a contribution concise and to the point they ought to congratulate the author. He noticed the old water supply seemed to be only used now for trade and road and sewer purposes. Was that due to the wells and brooks becoming polluted, or salt getting into it? In an industrial town like Northwich a large amount of water must be used, and to have a double supply was a very useful thing indeed. He would like to know the water rate, and how much per 1,000 gallons was paid for water used for trade purposes. One thing which had struck him was the large range of work that Mr. Brooke had entrusted to him. The difficulties with which he was faced in connection with the sewerage not only called for their sympathy, but admiration for the way in which he had tackled the work; continual troubles of that kind demanded great watchfulness and skill. Was any special form of joint used—iron pipes, or any special form of bitumastic joint, or simply ordinary stone pipes with cement joints? It seemed to him that a bitumen joint would be the best, as it would give a little. He had to sympathise with the Northwich council after carrying out works of sewage disposal which met the wishes and requirements of the Local Government Board being compelled eight years later to spend another £4,300 in order to bring the undertaking up to present-day standards. He supposed there would never be any finality about sewage disposal, but it was a distinct hardship on people who had gone to a great expense on a scheme to be almost immediately afterwards called upon to supplement the works or alter the character of the works altogether. He saw that electrically-driven centrifugal pumps were used, and he would like to know that was due to the cheapness of electricity as compared with steam or suction gas, for, unless pumping was of an intermittent character, electric power was an expensive matter. He would also like to know whether Mr. Brooke had had any trouble with the syphon under the river; but his own experience of syphons was that they were very liable to get blocked up, unless care was taken to keep them open. The jacking up of premises which had to be carried out following subsidences seemed to point to the desirability of all buildings in the town being so erected as to facilitate those operations, and to be a sufficient reason for by-laws different in character from those of other towns.

Mr. A. M. Ker (Warrington) said the matter of dealing with the rainfall in designing the sewers brought him to a point with regard to the pumps. He found that provision was made for over 2,000,000 gallons in the twenty-four hours, which was a very large quantity for a population of 19,000 people—well over 100 gallons per head. Had Mr. Brooke had any difficulty with the working of the automatic arrangement on the electrical pumps? The district he (the speaker) came from was in parts a low-lying one, and the sewage was dealt with by Shone's pneumatic ejectors. It would be necessary to extend the system of pumping in places in order to take in further districts, and he would be interested to know in more detail how these electrical pumps worked.

Mr. J. A. Settle (Bury), after making an inquiry as to the hardness of the water, asked if Mr. Brooke had experienced any difficulty from his sewers being damaged by chemical wastes. At the present time he was reconstructing a sewer damaged in that way, and he had found it necessary to protect the pipes by two layers of bitumen. In regard to the housing scheme, the greatest difficulty he had was to educate his council to the fact that municipal corporations could not build houses as cheaply as private builders. The private builder looked for a return of, say, 5 per cent, and at the end of twenty years expected to sell those houses at the same price they cost him, or somewhere about it. In the case of a corporation they got borrowing powers. For the first twenty years at least they could not show that houses were going to pay for themselves—unless in other places they were more fortunate than at Bury. At the end of twenty years they had paid off one-fourth the cost of the land, the cost of the street works, and part of that of the buildings. Unless they could show this as an annual balance-sheet, the corporation said they were losing. If Mr. Brooke would add to his paper what he intended to spend on street works in connection with these houses, and what he would get in rent, it would be very helpful. Were the houses to be built in rows or semi-detached? If semi-detached, which was most desirable, especially in a place like Northwich, where land could not be so expensive, they could dispense with back roads and save street works.

Mr. A. B. Statham (Salford) stated that they were troubled a good deal in his district with subsidences due to colliery workings, and he was interested to know of any methods of dealing with such troubles —particularly as regarded water mains. In some cases they had found it necessary to encase their sewers —21-in. pipes—with planks bound round with steel bands. Latterly their sewers had been laid entirely on reinforced concrete, but that had not been done long enough for him to say how it answered. They found that these methods of dealing with subsidences were expensive, and therefore he was anxious to learn of anything cheap and effective that could be adopted. The Northwich by-laws permitted the erection of composite buildings of timber framing filled in with brickwork. He assumed the timber went right through the walls, but he should like to know whether it was a compulsory or purely optional form of construction. It seemed to him it was desirable almost to make it compulsory in the interests of public safety. Mr. Price had said that electric pumping was not economical, but with a fluctuating flow he should have thought it was.

Mr. Settle, in some further remarks, said he regarded it as a mistake for the council to have approved a scheme which had resulted in the front of the new baths projecting beyond the adjoining buildings. To bring the establishment close upon the street was an error they would realise when the building was in use.

The vote of thanks was passed.

Mr. Brooke, in replying, said he first wished to

all the works that he had described to the members. Proceeding to deal with the various points raised in the course of the discussion, he stated, as regarded the question of the strata, that they had sunk six or eight boreholes in his time, and these were all through the Keuper marl. These augmented the [illegible] per cent. [illegible] to a certain extent, the flow of the springs, but eventually they got an increase. In regard to the sewage works, these were intended originally to be precipitation works, but they were never used as such. As to tar-macadam, personally he had never favoured granite for tar-macadam. The smaller granite seemed to be fairly satisfactory, but there was a considerable amount of dust in it. With regard to the reinforcement of buildings, they had two reinforced-concrete buildings, and they were both on the Hennebique system. One of them had been erected four years, and, so far as one could see, it had stood the stress; at the same time they had to remember that it was very expensive. The source of the old water supply was polluted by chemicals to such an extent as to render it useless for anything; but finally a pipe line was put in beyond the area of pollution to their works and improved matters. They used the water for locomotive purposes. It was roughly filtered, and answered fairly well; but beyond that they could do nothing with it. The water-rate was 6d. in the £ on the assessable value, and the price charged for water was 9d. per 1,000 gallons for large quantities, the ordinary charge being 1s. The price for electricity was 2½d. per unit. Their installation was not long-lived. They were only getting it into form, and only getting their statistics up in regard to it. The advantage they had in running the centrifugal pumps was that they could run them through the night without any attention. The electricity works were not the property of the council, but of a private firm. As to the jacking-up of buildings, that was the only thing they could do; so far as his experience went for twenty-three years, they could not do anything else. With regard to the drains, some time ago an inspector of the Local Government Board went to Northwich to investigate the question of the by-laws for the adjoining rural district, and, along with the county medical officer of health, wanted to insert in the by-laws a provision that the whole of the drains should be constructed of iron. They [illegible] able to convince them of the impracticability of doing that. Previously the joints were of clay, but now they were made of cement—and if they broke they broke. In regard to the brine baths, they put in just enough brine to give the water a sort of floating action. As to the centrifugal pump at the outfall, they found that very reliable now. The automatic arrangement was put in by Adamsez. The total hardness of the water was 14. They had had no experience of the action of chemical wastes on their sewers. They were just outside the area of the chemical works. The difficulties with the water mains owing to subsidences caused him more worry than anything else. A recent test showed that a waste of no less than 50 per cent was going on. They knew the areas in which the faults existed, but it was impossible for them to locate the places exactly. A suggestion had been made that it should be compulsory in such a district that only buildings of a special type should be erected; but that was practically the case at present, for when it appeared likely that an unsuitable building was going to be erected, the compensation commissioners immediately stepped in.

VISITS.

After the meeting the members visited the new baths the council are now erecting to take the place of the old baths, which have been abandoned owing to damage by subsidence. The new swimming bath is constructed on a reinforced concrete raft, and the walls are of the same material, and these and the slipper baths, and the heating and brine-mixing apparatus were inspected with great interest.

After lunch at the Royal Hotel, the party drove by motor char-à-banc to the Marston Rock Salt Mine. They were shown over the mine by Messrs. Bradbury & Bennett, the Salt Union's courteous officials, who had illuminated the mine in honour of the visit. The mine is 336 ft. deep, is practically circular, and covers an area of 30 acres. No timber props are used, as the roof of the mine is about 25 ft. high, and has a thickness averaging 50 ft. of rock salt, which is supported on piers left in the rock salt, each 33 ft. square, and spaced some 75 ft. apart. The salt is mined with cutting machines worked with compressed air at 20 lb. pressure, and by drilling and blasting, and a number of shots were fired during the visit of the party. The rock salt is chiefly used by the chemical works in the district, but large quantities are now being sent to France for the use of the cavalry and other horses.

A visit was next made to the sewage pumping station, where the electrically driven centrifugal pumps and the automatic gear for starting and stopping the pumps were inspected.

The party were then driven some 9 miles to the Cote Brook waterworks, near Tarporley, passing on the way the Anderton lift and swing bridge, and going over a roadway which, following subsidence, was being raised several feet. After inspecting the springs, boreholes and gauging house at Cote Brook, the proceedings were pleasantly terminated by the serving of tea at the Blue Cap Hotel.

ARTERIAL ROADS IN GREATER LONDON.

MEETING OF THE NORTHERN SECTION.

At the Local Government Board offices on Friday last a meeting was held of the Northern Sectional Conference in connection with the scheme for arterial roads in Greater London. The chair was taken by Mr. W. Regester (chairman of the Northern Sectional Conference), and those present included Colonel Hellard (representing the Board of Trade), Mr. George L. Pepler (representing the Local Government Board), Mr. W. E. Riley (superintending architect to the London County Council), Mr. W. Nisbet Blair (borough engineer and surveyor of St. Pancras), Mr. P. G. Killick (borough surveyor of Finsbury), Mr. E. J. Lovegrove (borough engineer of Hornsey), Mr. E. F. Spurrell (borough surveyor of Holborn), Mr. Cuthbert Brown (surveyor to the Edmonton Urban District Council), Mr. J. E. Sharpe (surveyor to the Cheshunt Urban District Council), Mr. C. H. Croxford (surveyor to the Wood Green Urban District Council), and Mr. H. York (surveyor to the East Barnet Valley Urban District Council).

The conference approved with unanimity the recommendations of the sub-committee that the following roads should be constructed: The North circular road between Edgware-road and Edmonton, the new Cambridge road between Hertford-road and Tottenham High-road, a proposed road between Essex-road and Lea Bridge-road, another between City-road and Hackney-road, and a by-pass at Chipping Barnet.

Considerable discussion arose on the subject of the building line and the authorities by whom it should be prescribed. The sub-committee submitted a proposition that "powers should be given to the London County Council and the council of any borough or urban or rural district to prescribe building lines to existing roads, or new roads recommended by the conference." The chairman argued that there should be an appeal to the Local Government Board, as he held the opinion strongly that the question of arterial roads emanated primarily from that authority. He felt quite sure that all the local bodies would help the Local Government Board to the best of their power. Other speakers took exception to the inclusion of the London County Council. Eventually an agreement was reached by the adoption of the proposition in the following amended form: "That powers should be given to county councils, after consultation with the local authorities concerned, to prescribe the building line on existing roads, to the maintenance of which they contribute, or to any other roads approved by the Arterial Roads Conference."

The conference also passed a resolution affirming the desirability of the Local Government Board preparing or obtaining preliminary estimates as soon as possible, so that the probable cost of the respective improvements may be available, and that in the event of unemployment following the war, or otherwise, information as to a useful outlet for labour will be ready to hand.

Colonel Hellard was requested to prepare 25-in. plans of the routes approved, to be kept at the Local Government Board as a record, and Mr. Pegler was asked to draft a report by the main conference setting out the chief routes approved, the principles advocated, and the further procedure that is proposed under present conditions.

The Royal Sanitary Institute.

THE VALUE OF MECHANICAL FILTERS IN THE PURIFICATION OF WATER.

By THOMAS ORR, M.D., D.Sc., Medical Officer of Health, Shrewsbury.

The efficiency of the mechanical filter must be gauged to a very large extent by the character of the water to be treated for example, if it has an excess of suspended matter, if it contains an unusual amount of peaty matter, causing a dark colour, or giving it a plumbo-solvent action; if it contains an excessive amount of iron in solution; if there is evidence of excess of bacteria, or if there are special difficulties in securing a suitable supply, as in the tropics or on military expeditions. The quality of the water is, of course, determined by its origin, be it an upland lake, natural or artificial, or a deep well free from pollution, or be it a shallow well or a river, polluted or liable to pollution. For convenience, the subject of the efficiency of these filters may be dealt with under five headings: (1) Suspended matter; (2) presence of iron in solution; (3) colouring matter; (4) plumbo-solvent action; (5) bacterial content.

Before considering these separate headings it may be appropriate to notice the change in the general chemical composition of the water brought about by the mechanical filter. On the general chemical results I place no importance. The chemical changes resulting from mechanical filtration have been put forward as percentages of purification; but those who put forward chemical results in this way miss altogether the significance of chemical analysis. Chemical analysis of water had originally as its object, before bacteriology was placed in such a secure position, the detection of sewage pollution; in other words, the detection of matter which is dangerous by reason of its perhaps containing pathogenic organisms such as Bacillus typhosus. If the extent of the chemical change in filtration gave any indication of the presence or absence of pathogenic organisms, then it would be of the greatest value; but the results of chemical analysis give no such indication. From the hygienic point of view, I am, therefore, not interested in the reduction of free or albuminoid ammonia in filtered water. What I am concerned about is the improvement from the æsthetic and the physiological standpoint; whether the suspended or colouring matter, or plumbo-solvent action is removed, or whether injurious bacilli have been eliminated. Beyond this, chemical results are of secondary concern. However, as a matter of general interest it may be stated that the greatest change in the water on being passed through the filter is that the albuminoid ammonia and the amount of oxygen absorbed are decreased.

The following table gives the analyses of water from three supplies, before and after filtration, through mechanical filters of different types:—

	Swinyshaw Reservoir, Mather & Platt's Delphic.		Shrewsbury. Bell's Blunt.		Reading. Candy's—Smith	
	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
Oxygen absorbed	0·1150	0·0522	0·090	0·044	0·150	0·030
Free ammonia ...	0·0138	0·0128	0·0050	0·0045	0·002	0·001
Albuminoid ammonia	0·0380	0·0133	0·021	0·007	0·023	0·008
Nitrous nitrogen	0·0	0·0	0·0	0·0	Slight trace	0·0
Nitric nitrogen	0·124	0·118	0·145	0·150	0·40	0·40
Chlorides	1·17	1·18	1·1	1·1	1·40	1·30
Hardness—temp.	0·0	0·6	0·2	0·2	11·0	11·0
Hardness—perm.	3·3	3·8	4·3	4·3	4·70	4·70
Nature of source	Moorland		River		River	

Taking the results into consideration one is led to conclude that the general effect of filtration through each of these three representative filters is practically the same.

SUSPENDED MATTER.

In the removal of suspended matter from the water there can be no question of the efficiency of mechanical filters of whatever make they may be. That they render the water clear, as tested by the 2-ft. tube, is testified to by many observers throughout the country. The effect of filtration is most markedly seen in dealing with very turbid water for example, from a river in flood. No severer test could be applied than in dealing with the water from the Severn, which is liable to heavy flooding, and which at times contains a very large quantity of insoluble solids. During spring and summer the flow of the river remains fairly constant as regards suspended solids, and at those times alumina is added to the extent of 1¼ grains per gallon; but during the autumn and winter when the river is high and floods are common, the amount of alumina added may be raised to 2½ grains per gallon. The clearer the water the less alumina is required. In the summer months the filters are cleansed every twelve hours, but on some occasions during the winter, and fortunately these are few, it may be necessary to wash out the filters every six hours and even every four hours. . . .

The chief difficulty in clarifying the water is the presence of the argillaceous or clayey matter. This fine material sediments slowly. I have several times allowed the 2-ft. tube to remain upright for twelve hours, and found that the fine particles had not sedimented even in that time. In dealing with such a water, sedimentation after adding the coagulant, but before passing through the filters, would relieve the work of the filters, and so bring about a better filtrate. Another factor to be considered is that the river may rise quickly, and those in attendance may be taken by surprise before the requisite proportion of alumina is added.

This flood water is very difficult to deal with by any kind of filter without preliminary sedimentation, and perhaps the mechanical filter is preferable to the slow sand filter, which would soon become clogged by the sedimentary material. . . .

PRESENCE OF IRON IN SOLUTION.

Iron may be found in solution in water from deep wells. It exists in solution in the ferrous state by reason of the presence of carbonic acid, and in the presence of air becomes oxidised, and is precipitated, after which simple filtration will remove nearly all the iron present. If the water is free from pollution, which is probable in the case of a deep well, treatment is only required for the removal of iron. Here the installation of mechanical filters may be all that is necessary.

In the process of removing iron in solution the water must be aërated to cause oxidation and precipitation. In the Candy filter which is in use for this purpose at Hastings, Tunbridge Wells, Cromer, and other places, the aëration is conducted within the filter. With the other filters oxidation is performed by aëration in a separate aërator. At Crewe the use of Bell's filters after aëration of the water in reservoirs is effective in removing all the iron present. At Newquay, the Mather & Platt filter, with an aërator, produces the same result. Candy filters at Hastings, Tunbridge Wells, and Cromer have proved a success in removing practically all the iron originally present in the water. Provided aëration is sufficient for complete oxidation, simple filtration through the mechanical filter is all that is necessary for the removal of practically all the iron present.

COLOURING MATTER.

There appears to be no doubt that mechanical filters act more efficiently than slow sand filters in removing peaty colouring matter. The alumina used in most of the types of mechanical filters seems to form a film which effectively arrests most of the colouring matter, perhaps by a specific mordant action. Again, the polarite of the Candy filter appears to have a selective action on the peaty bodies which give rise to brown colour of the water. It cannot be questioned that the action is a marked one. . . .

PLUMBO-SOLVENT ACTION.

Plumbo-solvent action is commonly found in moorland waters, the property being due to the presence of peaty acids, which impart an acid reaction to the water. . . . To counteract the action of peaty acids, neutralisation may be carried out, as is done in the process of mechanical filtration, by the addition of lime or sodium carbonate, which is added in sufficient quantity to neutralise the acidity and at the same time re-act on the alumina added to force the coagu-

* Extracts from paper read at a meeting of the Royal Sanitary Institute, held at Shrewsbury on May last.

limit, or, in the case of the filter not using coagulant by the addition to the filter bed of magnesium oxide, which is slowly dissolved out.

Very careful investigations have been conducted by several observers especially with regard to two types of mechanical filter in which coagulant is used. Frankland, in making observations on the Stockport water before and after filtration through Bell's filters, found that the plumbo-solvent was reduced by 76·3 per cent, taking the average of a year's weekly samples. Delépine ascertained that the action of moorland water on lead, after chemical treatment and passage through Bell's filters, was considerably reduced and rendered negligible. . . . Ross and Race, studying both Mather & Platt's and Bell's filters, obtained somewhat similar results, the plumbo-solvent action being reduced to a very small amount or completely abolished, and the water giving a definite alkaline reaction.

Although the methods of determination adopted by these observers were different, their scientific accuracy may be taken for granted. These results, coming from men of a high reputation, give expression to the remarkable efficiency of this method of treating water possessed of a plumbo-solvent action which is dangerous to consumers.

BACTERIAL CONTENT.

. . . The bacterial content of the water need only be considered in relation to the filtration of water which is polluted, or suspected of being polluted, by excremental matter. Upland or deep well waters are likely to be beyond reproach, and the effect on the bacterial content is only of secondary importance.

In the first place it is necessary to allude to the fact that until a sufficient mat of bacteria and algæ forms on the surface of the filtering material, the maximum efficiency of the filtration process cannot be expected. This film, however, quickly forms, and Ross & Race, experimenting with both Bell's and Mather & Platt's filters, found that, under ordinary circumstances, after washing, the percentage of purification obtained at the end of ten minutes' working of the filters was 91·9 and 94·7 respectively.

In my own experiments carried out at Newcastle 1910, I found that Bell's filters, two minutes after washing, gave a percentage purification of 91·9 and 87·0 respectively, in two experiments; and fifteen minutes after washing a percentage purification of 95·9 and 92·4 respectively. The time between washing and efficient action of the filter is thus so small that it may be neglected.

As to the bacterial efficiency of mechanical filters, Frankland showed that, working with Bell's type, an average of 95·7 per cent purification could be obtained. This average deals with a year's weekly samples of the unfiltered and filtered waters, the unfiltered water containing from 45 to 795 bacteria per c.c. and the filtered water from none to 45 per c.c. This water was obtained from an upland source not exposed to pollution. At York, where mechanical filters are used for preliminary treatment instead of storage before filtration through slow sand filters, the average reduction in the bacterial content of the water, which is obtained from the Ouse, was found to be 86·2 per cent without the use of a coagulant; but with the addition of 1 grain per gallon of sulphate of alumina, in an experiment lasting six days, an average reduction of 93·37 per cent was obtained. At Bolton, where Mather & Platt's filters are in use, Ratcliffe (quoted by Ross and Race) found in a series of weekly examinations extending over fifteen months that the average reduction of bacteria was 95·6 per cent. Here the untreated water contained from 52 to 795 organisms per c.c. Delépine points out that, if the number of bacteria in the untreated water is very small, little reduction in the number is made by filtration; when the number of bacteria in untreated water does not exceed 5, 10 or 20 per c.c., very little improvement can be expected from treatment. The results of Ross and Race bear out these observations. Bell's and Mather & Platt's filters were kept under supervision by these observers, and 74·7 and 75·9 per cent purification respectively were found in dealing with water containing from 40 to 95 bacteria per c.c. in the original condition. Both Delépine's and Ross and Race's results were obtained from water which did not require filtration for the reduction of bacteria, but which was being filtered mechanically for other reasons.

During the first year of operation of Bell's filters in Shrewsbury analyses gave an average purification of only 73·3 per cent, but after the treatment was adjusted, and certain defective valves in the chemical apparatus were corrected, the bacterial purification was found towards the end of 1910 to be from 95·9 to 96·6 per cent. Recent samples taken a few weeks ago gave successively 96·1, 94·1 and 95·6 per cent purification. At Edinburgh, with the same class of filter, a similar result was obtained—a percentage reduction of from 67 to 81 in the earlier periods of testing, but a greater reduction when the chemicals were adjusted, the washing regulated and the filters kept under careful supervision. These experiences point to the necessity of careful and intelligent supervision of the filters, checked by bacteriological examination, so as to determine the amount of coagulant to be used and the periods of washing. The Mather & Platt and Bell filters have been found to act in an equally efficient manner when compared under the same conditions, and it is probable that the Paterson filter, acting, as it does, on the same principles, has the same efficiency. With regard to the Candy filter, no extended bacteriological results appear to be available, and one is inclined to be sceptical as to its equal efficiency when no coagulant is used. Extended observations are required to improve our knowledge of the comparative value of all these types of mechanical filters.

There is a serious source of fallacy in speaking of the bacteria in the filtered water as so much per cent purification, for the ultimate bacterial content may be large, although the percentage would indicate a large amount of purification. For example, the water of the Severn may contain anything from 143 bacteria per c.c. in the dry-weather flow in summer to 9,920 per c.c. in winter high-level flow (flood water in all probability will contain more than this); but 94 per cent purification in the former would result in 8 bacteria per c.c., and in the latter 590 per c.c., the latter the result of an actual analysis. On another occasion, as already noted, when the river water contained 8,000 per c.c., the filtered water gave 290 per c.c.—equal to 96·4 purification. This amount of purification cannot convert a polluted water into a potable one. For total bacteria in potable water the general view is that it should contain more than 100 bacteria per c.c.; but less than this amount does not render a water potable, since the presence of B. coli and its relatives must be considered. Houston, perhaps, expresses the general view of bacteriologists regarding the subject when he states: "Everything depends on the local circumstances, and a standard suitable for one place may be too high or too low for another. . . . Hence it may be said that there seems no convincing reason why, generally speaking, the absence of typical B. coli from 100 c.c. of water in a majority of representative samples should not be taken as a 'working standard.'" Were the water passing through the filters at Shrewsbury intended for potable purposes (which it is not, since another pure supply is available), the extreme limit of absence of B. coli in 100 c.c. would have to be required, since the river is known to be polluted by sewage. Severn water almost invariably contains B. coli in 1 c.c., and sometimes in $\frac{1}{10}$th c.c., and the filtered water contains usually B. coli in 50 c.c., and sometimes in so small a quantity as 10 c.c. In the samples taken four weeks ago at several days' interval, B. coli were found in 1 c.c. of the river water, and in one out of three 10 c.c. tubes of filtered water. This result cannot be considered satisfactory from a hygienic point of view.

It may appear irrelevant to quote Shrewsbury results, since the water is not used for potable purposes; but I have in mind other towns which receive their general water supply from rivers, only mechanical filtration being employed for purification before reaching the consumer.

These filters have no selective action on B. coli, and so not on *B. typhosus*. *Bacillus coli* is taken to be an index of danger of pollution by *B. typhosus*. Should the water be polluted from the discharges of a typhoid patient, the filters, while acting as a medium of dilution of the poison, would not act as an effectual safeguard. On this account mechanical filtration alone cannot be depended upon to render a polluted water, or one supected of pollution, satisfactory for potable purposes.

Recourse must be had to other methods of rendering the water safe—for example, preliminary storage or sterilisation. Preliminary storage for a sufficient length of time, as recommended by Houston, will render the water free from *Bacillus typhosus*, the number of other bacteria being lessened at the same time. Houston recommends thirty days' storage, although, from the results of his experiments to determine the viability of "uncultivated" typhoid bacillus in water, one would consider a fortnight a

sufficient length of time to render the water practically "safe." In his observations on raw Thames water stored for about fifteen days at Chelsea, he found that the organisms were reduced, taking one year's samples, on an average 95·3 per cent, the B. coli content being also reduced proportionately. If the typhoid bacillus is killed by sufficient storage, mechanical filtration, it may be concluded, is all that is necessary for the stored water to reduce the total organisms to an amount which cannot be objected to, and to render it fit for potable purposes. Further, storage accommodation could be the means of excluding flood water, and so equalising the quality of the raw water, and avoiding undue strain on the filters. If, as stated by Houston, slow sand filters without preliminary storage will remove 98 per cent of the bacteria, mechanical filtration, which removes well over 90 per cent, should be all that is necessary for water which as been stored for a sufficient length of time. At York, mechanical filters without coagulant are used instead of storage to reduce the number of organisms, the filtered water passing on to slow sand filters before being supplied to the consumer, the total bacterial content being reduced by both processes to 99·1 per cent. I should, however, consider storage with mechanical filtration preferable to mechanical filtration plus low sand filters as possessing a greater degree of safety.

As to sterilisation of water, I shall simply allude to our experience of sterilisation at Shrewsbury. As I have already stated, the river water is not used for potable purposes; but to render it safe, should it be so used, it was decided to treat it with an antibacterial agent. On the recommendation of Dr. Rideal, "Chloros," a trade name for sodium hypochlorite, which has 12 per cent available chlorine, was employed, and gave striking results. The treatment was commenced in June, 1910, and has been employed ever since with small intervals for experiments. By experiment it was found that 1 part of chlorine to 2,000,000 parts of water rendered the water practically sterile, without a trace of chlorine being evident on testing by means of starch and potassium iodide. When the treated water is examined in quantities of 3 c.c., organisms are usually absent, although at times there may be as many as 12 organisms per c.c. present. But the striking result is in the B. coli content. Repeated examinations have shown B. coli to be absent in 250 c.c. of water, and in a few examinations made of 500 c.c. a negative result has been obtained; the water may therefore be considered a safe water even for drinking purposes. As to the presence of chlorine in the treated water, no complaints have been made since the first few days of the experiments, when 1 part of chlorine in 1,000,000 parts of water was added, and then it was detected by the starch and iodide test; but daily testings for free chlorine, from July 11, 1910, to December 6, 1911, gave consistently negative results.

In this country there is some prejudice against the addition of chemicals to water for the purpose of purification, and it may be appropriate to consider at this point whether any alumina passes through the filters into the general supply. Delépine found no excess of alumina in the treated water over the untreated. Molyneux, at Stockport, found a film on the bottom of the service reservoir, which has a storage capacity of twenty-four hours, and through which 400,000,000 gallons of water had passed in the eighteen months before being inspected.

At Shrewsbury the service reservoir, with a capacity of slightly over 250,000 gallons, was found, after a year, to have a film of brownish flocculent material of a thickness of ½ in. over the bottom. This film was found to be composed chiefly of hydrate of alumina and iron, derived, presumably, from the coagulant added. The capacity of the reservoir allows an average rest of five hours for the treated water before reaching the consumer, and gives sufficient time for sedimentation; but when one considers that over 400,000,000 gallons of water passed through the reservoir in twelve months, the small amount of deposit may be considered negligible. Repeated tests of the filtered water as supplied to the consumer have failed to show the presence of alumina, so that it may be accepted that if alumina does pass through the filter at times, its amount is negligible from the physiological aspect.

MERITS OF MECHANICAL FILTERS AND SLOW SAND FILTERS.

There is ample evidence that, under ordinary circumstances and with careful supervision, the slow sand filter is slightly more efficient in reducing the number of bacteria present in the raw water. The reduction, however, varies just as with the mechanical filter in accordance with the amount of care devoted to the management of the filtering process. Even with careful management the results with the sand filter may not come up to one's expectations. Houston states that the slow sand filter removes 98 per cent of the bacteria, but at Bolton a comparison of the results of slow sand filters and mechanical filters dealing with the same water showed a percentage purification of 88·8 for the former and 95·6 for the latter.

For the removal of suspended particles, colouring matter, iron in solution, or plumbo-solvent action from a water derived from a source free from human pollution, the mechanical filter appears to be the filter of choice. But, given a water polluted, or suspected of being polluted, without sufficient storage of raw water, or without sterilisation of the treated water, the slow sand filter gives a slightly greater measure of safety. Mechanical filtration combined with storage, however, can be depended upon to give a water which can be considered satisfactory from a public health standpoint. Whether sterilisation of a polluted water can be depended on under all circumstances remains to be proved. So far it has not had a sufficient trial.

In tropical countries, and in active warfare, mechanical filters, combined with a sterilisation process, seems the best method of coping with the difficult conditions.

Further advantages of the mechanical process over slow sand filtration are less capital cost, variously estimated at one-third to one-half that of slow sand filters; economy of space; working under cover; ease of management and cleansing; no interference of supply during cleansing; and less cost of maintenance. Ross and Race have estimated the maintenance charges in connection with a slow sand filter, and with mechanical filters of two types dealing with the same water. They found that the cost per 1,000,000 gallons of water treated by sand filtration was 12s. 11d., and by the mechanical filters 9s. 8d. and 9s. 7d. respectively. These observers give the capital cost of the filters per 1,000,000 gallons of water filtered as £7,989 10s. for the sand filters, and £3,623 4s. and £3,458 4s. respectively for the two types of mechanical filters—Bell's and Mather & Platt's—and the yearly cost per 1,000,000 gallons of £1 13s. 3d., £1 3s. 7d. and £1 2s. 10d., calculating on the loan periods allowed by the Local Government Board. Delépine quotes Dixon, who gives the cost of dealing with 1,000,000 gallons of water by means of Mather & Platt's filters as 9s. 5d. for treatment and maintenance, and an annual cost of 14s. for one installation, and 14s. 8½d. per 1,000,000 gallons for a second installation, taking the annual charges on capital on a forty years' loan basis.

Mechanical filtration, therefore, possesses considerable advantages over slow sand filtration, the chief being the lower capital outlay and the lower maintenance cost. Taking into account the efficiency of these filters, along with the economy in their installation and management, I believe that slow sand filters will be superseded in many cases where formerly they were considered absolutely essential.

[A report of the discussion which followed the reading of the foregoing paper will appear in next week's issue.]

Institution of Gas Engineers.—The annual meeting of the Institution of Gas Engineers was held on Tuesday in London, the president, Mr. John Bond, engineer and manager of the Southport Corporation gas department, in the chair. There was a large attendance of members from all parts of the country. At December 31st last the membership roll of the institution bore 881 names, as compared with 875 at December 31, 1913. The number is made up thus—honorary members, 27; members, 738; associate members 111; associates, 2; students, 3.

New Library for Bradford.—The Lord Mayor of Manchester recently opened a new public library at Bradford. When the district was incorporated with Manchester the town hall in Brooke-street was left vacant by the abolition of the old local board, and the building was utilised by the corporation as a reading-room. This was opened in 1887. Two years later a juvenile library was opened in one of the lower rooms, and a lending library was afterwards added. The new library, which has cost, with equipment, £4,000, has taken the place of the old building. The city architect has designed it.

The Surveyor
and Municipal and County Engineer.

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NATIONAL GUARD ENGINEERS AT BRIGHTON.

A detachment of the Engineers' Unit of the City of London National Guard Volunteer Corps took part in the Whitsuntide manœuvres of the regiment at Brighton. The Engineers were engaged in various field operations under the command of Platoon-Commander W. Neptinstall Millar, instructor to the unit, by Sergeant-Major Collier, R.E. (T.).

On Saturday the Engineers took measurements and prepared sketch drawings for a military bridge of 50ft. span across the road to Newmarket. Afterwards set out a full-size longitudinal section of the bridge, the structural members being represented by tapes pinned down upon the grass. During these and other operations the Engineers were protected by a covering party of infantry under Platoon-Sergeant A. J. Wall, this party having been detailed from the company in charge of Platoon-Commander W. Heptinstall Millar.

On Sunday morning the detachment was engaged in surveying a site at Patcham suitable for the establishment of headquarters. The survey was conducted under the direction of Sapper R. F. Harvey, M.INST.C.E., by whom a sketch plan was prepared.

On Whit-Monday the Engineers visited the new ferro-concrete sea walls and groynes at Roedean and Rottingdean, where the principles of construction were explained by the officer in command. In the afternoon a reconnaissance was made across the Downs preparatory to the selection of a defensible position. An ideal position of the kind was found to the north-east of Rottingdean, and on it lines of trenches were pegged out, a plan of the works and surrounding country having been drawn by Sapper H. Smith.

On Tuesday morning the unit were occupied in setting out on the grass full-size longitudinal sections of two variations of the bridge design prepared on the previous Saturday, and this concluded four days of practical training of a particularly interesting and instructive character.

Council Surveying Party Arrested at Altcar.—Three officials of the West Lancashire Rural District Council—Messrs. John Wignall and H. Harr (surveyors), and Mr. J. Holland (road foreman), all of Ormskirk—had an unpleasant experience on Wednesday. They were engaged in surveying land with plans in their possession at Altcar, near Formby, which is within the council area, when the suspicions of a military guard close by were aroused, and they were placed under arrest. Explanations were useless, and for nearly seven hours the officials were detained in the guard-room until identified by a police inspector who formerly lived at Ormskirk.

STAFFORDSHIRE MAIN ROADS.

COUNTY SURVEYOR'S TWENTY-FIFTH REPORT.

An interesting fact in connection with the annual [illegible] presented [illegible] by Mr. J. [illegible] Moncur, M.INST.C.E., county surveyor of Staffordshire, to the Main Roads and Bridges Committee of the Staffs County Council, is that it was the twenty-fifth record of a similar kind which that gentleman had prepared.

Motor traffic (Mr. Moncur states) has unquestionably for some years past been causing great deterioration of the upper crust of many of the main roads, and, unfortunately, it is now adversely affecting the foundations of our strongest and best-constructed roads. The movement of military self-propelled vehicles for the Front, and also military equipment and stores in many parts of the county during the past winter, formed no small proportion of the increased tonnage that the roads have had to carry. The increase in the motor-omnibus traffic, which, in my opinion, is the heaviest and most destructive road traffic, has unquestionably done the most damage, and the effect of the past winter has reinforced my opinion that ordinary macadamised roads are wholly unsuited to bear the strain of such traffic.

The deterioration of the main roads, which is self-evident, is probably due to three causes—(*a*) the great increase in traffic, both in volume and weight, which they have had to bear, (*b*) the amount expended annually has not been sufficient to meet the annual wastage, and (*c*) the traffic has been far greater and heavier than the roads were originally constructed to carry. Sudden failure or collapse of some roads is, no doubt, also in a large measure due to the age of the water-bound coatings.

In one of my previous reports I pointed out that the older macadamised coatings were standing better under the modern traffic than the newer coatings, and this fact no doubt accounts to a certain extent for the increased mileage of unsatisfactory road surface, as the imperative renewal of the old surface diminishes the old area and increases the area of the new. The resultant injury to "green" coatings can never be effectually repaired, no matter how carefully they may be patched and attended to—or, in other words, once damaged always unsatisfactory.

The Motor Car Act came into operation in 1903 and the Heavy Motor Car Order in 1904, both of which revolutionised traffic on roads. This self-propelled traffic led to an enormous increase of light and heavy traction-engine traffic, and the result is a regular procession of all kinds of traffic on some of our leading lines of road giving them more the appearance of railways than roads. Notwithstanding this radical change in the character of the traffic, I think it is a matter for thankfulness that the roads have been able to sustain such traffic so long. This is doubtless largely due to the substantial work carried out in the first years of the county council's control of the roads.

CORRUGATION.

Railway and tramway engineers have been exercising their minds for some time to explain the reason of the phenomenon of rail corrugation, which practically dates from the time electricity was introduced as the motive power, and to devise, if possible, means of overcoming the difficulty, as immediately corrugation is set up rapid deterioration and ultimate destruction of the rail soon follows. It is contended by some engineers that the small diameter wheels, together with the low centre of gravity, account for this, while others contend that it is largely, if not entirely, due to the chemical composition of the rails, and others the manner in which the rails are made.

Road engineers have now exactly the same phenomenon to contend with, the difference being that, in the case of rails, the corrugations are comparatively small, and not noticeable unless on very close inspection; but the "roar" of the car, even to the uninitiated, unpleasantly indicates that things are not as they ought to be. If steel rails are liable to corrugation under the traffic they have to carry, it is not surprising that corrugation should form on ordinary macadamised roads subjected to modern traffic.

Modern traffic is specified advisedly for the simple reason that none of the 600 miles under our direct control had shown the slightest indication of a wavy surface until comparatively recent years. This is, in my opinion, due to the concentrated weight on comparatively narrow wheels of small diameter being propelled at exceptionally high speeds. There is no

doubt also that the unequal distribution of the load contributes to this result. For instance, something like 75 per cent of the weight is on the hind or driving wheels of most self-propelled vehicles. This is done with the view of facilitating the steering and also increasing the propelling power of the machine; but I am convinced that if the loads on both the front and hind axles were brought more into harmony the corduroy surfaces now obtaining on most roads would, to some extent, be done away with.

SCIENTIFIC ROAD MAKING.

The successful road engineer in pre-motor days was he who could vary and adapt his system of maintenance amply to sustain the traffic (heavy or light) under all conditions of weather on all classes of subsoil at the minimum cost, or, in other words, who built and maintained his roads with the smallest margin of strength in excess of that which was absolutely necessary for the traffic—success, I need scarcely point out, being also, in a large measure, due to the tactful handling of the roadmen to get them interested in their work, and, above all, training them to be observant, and especially to take note of the result of every act of their daily work. In fact, in former days the great majority of the lengthsmen were so well acquainted with every yard of road under their charge, and the traffic they were likely to carry, that at all seasons of the year and under all conditions of weather they did the right thing at the right time with comparatively little instruction or supervision.

Such men and such work will always be necessary on certain classes of roads, but I am afraid the time has come when it will be necessary to build and maintain heavily trafficked roads on more scientific lines. Modern traffic demands not only a more solid, a more durable and a smoother surface, but, in addition, it must be constructed and maintained with the minimum of discomfort to users of the road. Everything, therefore, points to the work of road maintenance being largely carried out in future by gangs of men under foremen closely supervised by specially qualified assistant surveyors.

COST.

Roads, unquestionably, are to cost in future much more to construct and maintain than they have done in the past, and it will therefore be so much the more necessary for the road engineer to consider well the local conditions—such as subsoil, drainage, gradient, the extent and kind of traffic—before determining on the mode of dealing with a particular road. All roads—even all main roads—are not carrying the same kind and volume of traffic, and consequently there will be ample scope for varying the system of maintenance to meet the varied and different conditions. Even on the same road carrying the same traffic throughout its entire length it may be advisable, and even necessary, to vary the character of construction owing to (*a*) different kinds of subsoil, (*b*) varying gradients, (*c*) the want of gradient, and (*d*) the shading of the road by trees, or the existence of a cutting.

With regard to (*b*) and (*c*): In the horse traffic period level roads were less costly to maintain than those with gradients, and the cost increased in the ratio of the increase in the gradient. This was obviously due to the hammering and tearing action of the horses' feet in their effort to climb the hill, and in a lesser degree in straining and slipping to keep back the load in going down hill.

Modern traffic (excepting traction engines with diagonal bars on the driving wheels), however, has completely reversed this condition of things. On gradients there is not only a lateral or cross fall, but a longitudinal fall as well, with the result that water does not lie on the surface. In the case of level roads there is only a lateral fall, and even that is comparatively slight so as to enable the traffic to use the full width of the road, and the consequence is if there is the slightest depression on the surface water will lodge, and by the action of the fast moving traffic the depression soon becomes a hole, which, if not promptly attended to, induces the formation of a succession of holes.

I have on many occasions pointed out how difficult it is, if not almost impossible, to maintain satisfactorily a macadamised road by the side of a tramway track, and I am now convinced that on certain lengths subjected to heavy motor and motor-omnibus traffic nothing short of paving with granite setts laid on a concrete foundation will suffice. There are also roads, such as the Walsall and Birmingham road, which should be similarly paved the full width.

Up to the present, all improvement and maintenance on the 600 miles of main roads under direct control have been paid for year by year out of revenue, but as the "life" of sett paving on concrete is anything between thirty and forty years, such work should be carried out with borrowed money, for the reason that it will ease the burden of the present ratepayers, and the next generation, who will partly reap the benefit, will carry part of the burden. Borrowing, of course, would only be resorted to when the expenditure was clearly of a capital nature.

In the case of the Walsall and Birmingham road, it tumbled to piece in two or three months' time. Prior to that the road was sound and in good order, and no difficulty was experienced in maintaining it with macadam, although it has, of course, been costing considerably more to maintain since the introduction of self-propelled vehicles. This is the first winter of the motor-omnibus traffic, and it, together with the additional heavy motor and traction engine traffic, has proved more than the road could carry. It is therefore evident that in such a case the necessity for altering the constructional character of the road is entirely due to self-propelled traffic, and consequently the Road Board ought to assist substantially in meeting part of the cost.

On a large number of our roads the great bulk of the traffic that passes over them is county borough traffic, and the Walsall and Birmingham road is a clear and obvious case in point. In fact, I make bold to say that more than nine-tenths of the traffic on this road is not county traffic at all, but either Walsall or Birmingham traffic, and neither community contributes one penny towards its upkeep, and this is another reason why the Road Board should assist.

TAX ON VEHICLES.

In turnpike days the actual users of the road paid for their maintenance, which, generally speaking, was equitable and fair, but although the toll bar has gone for ever, it should not be beyond the wit of man to determine and fix a tax for all vehicles that would to a certain extent be commensurate with the amount of damage done by them, and if the money thus obtained were spent in improving the roads a proportional benefit would accrue to the owners of vehicles in a considerable reduction in the cost of the upkeep of the vehicles and, besides, increased loads might be carried.

On motor-omnibus routes, for example, it is obvious that with an improved road the service would be more regular, there would be more comfort in travelling, thereby inducing more to travel, and, as in the case of ordinary vehicles, a perfectly satisfactory road would lead to a reduction in the cost of the upkeep of the omnibuses. This appears to me to be a traffic that certainly ought to contribute direct to road constructional work, as the omnibus company are using the roads as a tramway company would, but are relieved of the expense of constructing and maintaining a track.

Fortunately, it will not be necessary to alter the construction of all the roads, but I think it is fairly obvious, even to the casual observer, that some other mode of construction and manner of maintenance will require to be adopted on many of the leading lines of road, and it will be a matter for serious consideration to determine the best mode of reconstruction to adopt in each case so as to obtain good roads at the minimum of cost.

Surveyors' Institution Membership Roll. For the first time in the history of the Surveyors' Institution, the council of that body have to report a reduction in the number of members, the total in May, 1915, being 5,385 compared with 5,482 twelve months ago, due to a diminution of 107 in the number of professional associates, and 35 in the number of students. "Doubtless," the council remark in their annual report, "the war has had some effect in contributing to this result, but it was anticipated in the council report of last year, when it was pointed out that the exceptional increase in numbers which had taken place during the previous two years was caused by the desire of intending professional associates to enter prior to the closing of the doors to those who had not passed the final as well as the intermediate examination. The supply has now been shut off, and will not again become normal until a considerable accumulation of men who have passed the intermediate exists, from which the final examination and the balloting list may be recruited." The receipts for the year 1914 reflect the reduction in the membership. Considerably over 1,000 men connected with the institution are serving with His Majesty's Forces.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

The competition for May is divided between

Mr. M. T. [illegible],
Carlisle,
Graduate [illegible],
[illegible],

and

Mr. J. Watson,
22 Mount [illegible],
[illegible]-hill,
Leeds.

[illegible] the papers sent in the present month [illegible] the best received during the past [illegible]

QUESTIONS.

Final work answers are invited to the following questions:

482. Water Towers. What are the chief points to be considered in the design of water towers, and how do they originate? Is there any book dealing with the subject? (Rev.)

483. Bridge Construction.—How are the lengths of the four wing walls of a bridge and the [illegible] angle between the bridge and each wall [illegible]? (Tee.)

484. Hydrostatics.—A square sluice opening, 3 ft. by 3 ft., is formed in the vertical face of a tank, and the upper edge of the opening is 6 ft. below water. Calculate the hydrostatic pressure upon the square area, and find the exact position of its centre of action. (A.M.I.C.E.)

485. Building Construction.—A casement window-frame is to be fixed in a cavity wall (9-in. stone to [illegible] an inner facing of bricks, and a 2-in. cavity). Show clearly the methods of fixing, and any important features with respect to the relation between the window-frame and the cavity. (Mercator.)

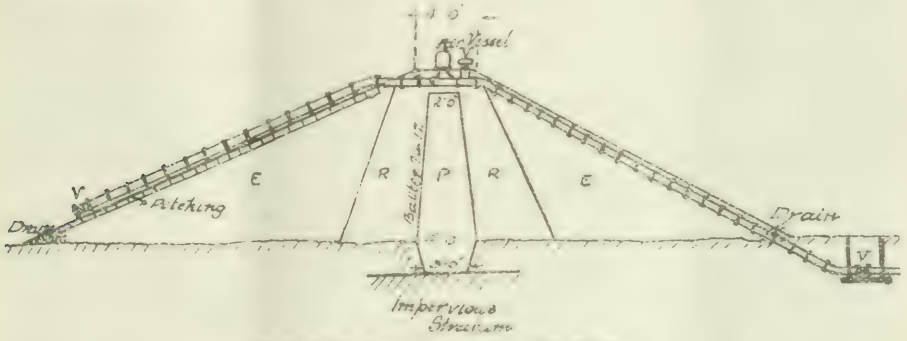
486. Sewage Ejectors.—How would you test the efficiency of a pair of 100-gallon alternating sewage ejectors with motor-driven air compressors? (C. A. B.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

479. Reservoir Dam.—Give sketch and description of an earth embankment, with clay puddle across a mountain brook 12 ft. wide, rising from each side of brook 1 in 2, the embankment to be 12 ft. high in the [illegible] bed. (R. P. M., *Towyn.*)

Before commencing the construction of the embankment all loose rock and other material should [illegible] the ends of the dam. The puddle trench should be carried down to [illegible] and great care must be taken to ensure that the trench is carried down to an impervious stratum, and that no water should pass from the reservoir under the puddle wall, or round the ends of the puddle trench. [illegible] at the puddle trench should be at one and the same level along its entire length, so that the [illegible] in the one which we are now discussing, the great object being to prevent unequal settlement of the puddle wall and the formation of cracks which might lead to leakage, and the consequent failure of the dam. The best method of working up the puddle is to dig and prepare it by cross-cutting, watering, &c., at the place where the clay is obtained, afterwards transporting it to the site of the embankment, where it is spread in layers which are not more than 6 in. thick, well compressed and thoroughly incorporated into one mass. The materials for the formation of the embankment should be obtained at or near the site of the reservoir, and, if possible, dug out from the bottom of the reservoir itself to increase the capacity of the same. The material available in this way often determines the form and section of the dam. The stuff, wherever obtained, should be sorted, and the materials of a finer and more retentive nature should be placed in the central portion of the dam to keep the puddle moist, the less compact being placed to form the outer parts of the dam. It is important not to make too sudden a change from material of one kind to others of different qualities, or which do not act together when subjected to pressure. The inner slope of the embankment is generally 3 to 1, but 2½ to 1 would be suitable in this case; it should be pitched over its entire area with stone 6 in. deep. The downstream slope should be at an inclination [illegible] and should be pitched. A good plan is to form toes to the slopes of any rocky material available, which, in addition to supporting the embankment at a weak place, also act as a drain to downstream slope, permitting any water which might accumulate therein to pass away. No large pieces of hard rocky material should be placed in the dam, as they would cause unequal settlement of the different portions of the embankment, while also reducing the cohesion of the materials. The embankment should be carried up in even layers, well consolidated by rolling or other method. An apron of clay is sometimes placed under the stone pitching of the upstream slope: but this is hardly necessary if the puddle wall is carefully formed, and abuts



[illegible] R. P. M. [illegible] P. [illegible]

Diagram [illegible] Reply to Question 479.

against impervious strata at its base and ends. The height of the embankment should be such that there is no danger of overtopping when the reservoir is full, or the stream in flood and a gale blowing downstream. As the height of the embankment is only 12 ft. in the river bed, a syphon outlet would be most suitable in this case. This type of outlet does not endanger the dam. The inner and outer ends of the syphon should be provided with proper valves which can be easily worked whether the reservoir be empty or full. The effective head necessary to work such a syphon is about 2 ft. A valve for extracting air from the syphon and for charging the same with water should be placed at the summit. If a rocky, impervious stratum occurs in the bed of the river where the dam is constructed, an outlet pipe or culvert can be founded on the stratum and allowed to penetrate the embankment under the puddle wall. With this arrangement we would be able to drain the water in the reservoir to a lower level than with the syphon outlet; but care should be taken by placing flanges on the pipe or culvert projecting into the bank to prevent the leakage of water along the outside of the pipe or culvert. The dimensions of the waste-water channel and weir should be large enough to prevent the level of the water in the reservoir rising higher than within, say, 3 ft. of the top of the dam. A low parapet wall might be constructed along the top of the embankment to prevent damage from waves. It is advisable to place the waste weir at one side, and, if possible, beyond the earthen dam. The waste weir should be constructed in masonry, and if contiguous to the earthen dam the latter should be carefully protected from scour by the formation of wing walls supporting the side slopes. A third method of forming an outlet conduit would be by tunnelling into one bank of the stream around the end of dam. The outlet would first be made, and would be utilised for the diversion of the stream during the construction of the dam. (M. T. R., *Rhyl.*)

480. Sewer Survey.—It is required to survey the course of an old brick sewer, 5 ft. diameter, which runs for 1,000 yds. in a very irregular line in a thickly populated district. There are no available manholes. How can this be done, and what instruments would be used? (W. S. W., *Chesterfield.*)

A somewhat similar procedure to that used in the case of the setting out of a railway tunnel would be adopted. It is assumed, for the purposes of this question, that the sewer is open at both ends, so that the position of the same may be ascertained and plotted on the plan in the ordinary way. The actual survey inside the sewer would be carried out with the theodolite, an observation being taken at each end of the sewer on to some fixed object, such as the corner of a building, the position of which is already on an ordnance map. Measurements must be taken in order to fix the position of the axis of the theodolite at each end. The survey itself may be carried out as a magnetic bearing survey, but, as the district is thickly populated, it is safe to assume that there would be gas and water mains in close proximity, and that there is therefore the risk of an appreciable attraction of the compass needle due to this cause, which would seriously affect the accuracy of the work. In view of this the wiser course will be to make an underground traverse survey, merely taking straight lines along the floor of the sewer, and obtaining the angles at changes of direction in the ordinary way. Curves, if any, can be obtained by offsets from a straight line taken in as long a length as the curve will allow. A check on the work is afforded, since the positions of the commencement and finish of the survey are fixed, and the lengths and directions of the straight lines forming the main chain line should check in to a reasonable degree of accuracy. The theodolite and poles used in the work will, of course, have to be illuminated. All important connections encountered should be plotted. Should a section of the sewer be required, it may be obtained by taking levels along the entire length of the invert and reducing the various levels to ordnance datum by connecting the chain of levels to an O.B.M. at each end. A short staff, about 4 ft. 6 in. long, would be required, with a lamp for illuminating the graduated side, and the tripod of both the level and the theodolite must be either a special one with short legs or one of the telescopic variety, such as are used in headings. Should it not be possible to take an observation at each end on to a fixed object, owing to the ends of the sewer being below the level of surrounding points suitable for use in observations, the position of the manhole or other connection to the ends can be fixed in the ordinary way, and a plumb line can be dropped down, the vertical axis of the theodolite being adjusted so as to be directly below the bob. On measuring the position of the end of the line at ground level, we have also the position of our instrument. (B. K., *Newport.*)

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Branston R.D.C. (June 1st. Mr. A. W. Brightmore).—£3,800 for works of sewerage.—It was stated that originally a much larger scheme was contemplated, the expenditure being estimated at £21,600, but owing to the difficulty of raising loans at present a modified scheme was prepared. The surveyor, Mr. T. Howitt, explained that the Boultham estate was being developed for residential purposes. There were already 191 new houses in existence. It was contemplated that eventually the scheme would serve about 3,120 houses.

Chapel-en-le-Frith (May 19th. Mr. W. O. E. Meadows) ... £3,250 for new works in connection with the Chapel and Fernilee water scheme, and £700 for the construction of a reservoir at Dove Holes.—It is proposed to purchase additional springs at the Neek, Fernilee, and to erect a pumping plant. It was desired that the repayment of the loan shall be spread over as many years as possible. Mr. J. B. Boycott, the clerk, requested that the loan should be granted at once. The sewage scheme was now complete, and additional water was needed for the conversions to the water-carriage system and for baths.

Clayton U.D.C. (May 27th. Mr. Edward Leonard).—This was an inquiry relative to the accommodation for the housing of the working classes in the district.—The clerk, Mr. W. Sheard, said he was instructed to say that at present the council did not consider a scheme necessary. Dr. Stanfield (medical officer) expressed the view, however, that there was a need for houses, and a dozen would meet the difficulty. The great necessity was houses with two bedrooms, an attic, and a kitchen and scullery. The rents should be from 6s. 6d. to 7s. 6d.

APPLICATIONS FOR LOANS.

Larne R.D.C.—£360 for a water supply for Woodburn.

Stalybridge Tramways and Electricity Board.—£4,000 for electricity transformers and mains.

Rawmarsh U.D.C.—£2,000 for a drainage scheme for the south ward.

Southgate U.D.C.—£1,800 for the construction of a public convenience.

LOANS SANCTIONED.

Billericay R.D.C.—£270 for the purchase of a site at Hutton for outfall works.

Gloucester T.C.—£1,500 for electricity extensions.

Willesden U.D.C.—£1,112 for an electricity feeder cable.

Derby T.C. — £25,090 for electricity purposes; £8,190 for the purchase of land for recreation ground and other purposes on Osmaston Park road; £3,500 for the improvement of the Wardwick, and £1,057 for the extension of the fire station.

Ballymena U.D.C.—£7,000 for the extension of the water works.

York T.C.—£30,681 for tramways, and £5,530 for [illegible] purposes.

FORTHCOMING INQUIRIES.

JUNE.	£
7. **Walthamstow.** For the purchase of land for a depot (Mr. F. H. Fallaize)	1,300
8.—**Bradford.** For the reconstruction of [illegible] (Mr. A. C. Dray)	2,377
8.—**Sheerness.** For the enlargement of the refuse destructor (Mr. P. M. Cresthwaite)	5,000
8. **Sunderland.** For the purposes of a housing scheme (Mr. H. A. Chapman)	22,260
9.—**Stockport.** For the purposes of the gas undertaking (Mr. R. H. Bicknell) ...	14,023
10. **Peterefield.** For works of water supply (Mr. P. M. Cresthwaite)	840

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYORS and others with a view to making this record as complete and accurate as possible.

The following are among the more important proposed works of a public character appearing in Building Bye-laws, Plans, Maps, Specifications, and town planning Bills, Local Legislation, Water and road materials, Engineering, Contract Notices, St. Austell, Twickenham; sewerage and sewage disposal—Cricklade, Dorchester, Farnham, Gosport, Thame, water, general—Barnstaple, Dewsbury, Glasgow, Upton-on-Severn.—Particulars of other projected works will be found on our "Local Government Board Inquiries" page.

ADMINISTRATION.

Kent C.C. A recommendation by a joint committee has been adopted transferring the supervision of the county bridges and the execution of improvements and repairs in connection therewith from the county architect (Mr. F. W. Ruck) to the county surveyor (Mr. H. T. Chapman). Mr. Ruck, who, up to the year 1880, had held the office of county surveyor, [illegible] cover and include all necessary clerical and office expenses. His present salary is £600.

BUILDINGS.

Bexhill T.C.—The council have agreed to proceed with the drainage works and the erection of the observation block in connection with the new hospital scheme, at an estimated cost of £1,377.

East Preston R.D.C.—The surveyor, Mr. C. W. Leney, has received instructions to prepare an estimate and report on the repair of a three-span brick bridge at Ferring-road, Clymping, which had been [illegible]

Glasgow T.C. A recommendation made by the Health Committee to convert the Ibrox tramway depot into a temporary hospital for the treatment of phthisis [illegible] £5,000.

Middlesex C.C.—Mr. H. C. Crothall has received instructions to prepare the necessary plans for the proposed new assistant Hospital, and to carry out the further duties in connection with the erection of the asylum as the Visiting Committee may from time to time direct.—The Local Government Board have written assenting to a loan for the purchase of the site of the sanatorium in Essex. With regard to the erection of the building, the Public Works Loan Board wrote that the application of the council for loans for building could not be entertained unless evidence could be produced of Treasury or Local Government Board approval granted since the new conditions had been imposed.

Renfrewshire C.C.—The removal of the Upper Renfrewshire Fire Brigade from Pollokshaws to new headquarters at Darnley took place recently. Accommodation is provided for two motor engines and eight men, though one motor and six men will be sufficient until the district further develops. The cost of the buildings, which were designed by Mr. Robert Ewan, senr., architect, is £5,500.

Tipton U.D.C.—It was resolved on Tuesday last to proceed with a scheme for reconstructing four of the old retorts at the gasworks, which, it was stated, would represent an increased output of 30,000 cub. ft. per day, and would enable the works to cope with the demands from the Rowley Regis district and the growing needs of the parish. A larger scheme of extension suggested by the manager of the works (Mr. Prince) was postponed [illegible] it would entail, until after the war.

Uxbridge U.D.C. The surveyor, Mr. W. L. Eves, has received instructions to prepare plans for a public convenience.

York T.C. The Health Committee recommend the council to proceed with a scheme for the [illegible] of the fever hospital.

HOUSING AND TOWN PLANNING.

Blofield R.D.C.—The Local Government Board have sanctioned a loan of £70 for the purchase of land and legal expenses in connection with a housing scheme. The erection of the houses is, however, postponed.

Bristol T.C.—The Health Committee have authorised the Housing Sub-Committee to prepare a housing scheme.

Kingsbridge R.D.C.—The Local Government Board have again written respecting rural housing, asking to be more definitely informed what action was being taken by the council. The sanitary surveyor, Mr. W. H. Whitaker, reported that the inspection would be completed shortly. There were only one or two cases of overcrowding. The medical officer of health said the Local Government Board's own inspector, who had visited the district, had complained that a large percentage of the cottages were not right. They were wet—wring ng wet. They were built the wrong way, and could not be put right. Mr. W. H. Fairweather: Plenty of the farmhouses are also wet in damp weather. Dr. Webb: And so is my surgery. But when we told the inspector that the cause was due to the use of sea sand in the mortar, he would not have it. It was decided to reply that the council were not at the present time prepared to formulate a scheme, but that the house-to-house inspection was being expedited.

Longbenton U.D.C.—Authority has been received from the Local Government Board for the prepara- [illegible]

Pershore R.D.C.—At the council meeting on Tuesday a letter was read from the Local Government Board referring to the report of their inspector in connection with the contemplated housing schemes in the parishes of Wyre, Fladbury, and Peopleton. The board suggested that the council should proceed at once to prepare a scheme for eight houses (each containing three bedrooms) at Fladbury, and submit it to the board with an application for sanction for the loan required. When a satisfactory scheme had been settled the board would consider whether circumstances enabled them to sanction a loan for its immediate execution. The letter was ordered to "lie on the table."

Wantage R.D.C.—Instructions have been given to the surveyor to prepare a housing scheme for the district of East Hendred.

REFUSE COLLECTION AND DISPOSAL.

Sutton (Surrey) U.D.C. The provision of a refuse destructor is being considered by the Sanitary Committee.

ROADS AND MATERIALS.

Brighouse T.C.—It has been agreed to construct a new 40-ft. road parallel to Crowtrees-lane, and provide an ornamental plantation between the two roads.

Coventry T.C.—Consideration is being given to schemes for the improvement of Holbrook-lane, Foleshill-road, Waverley-road, and Holyhead-road.

Doncaster R.D.C.—A letter has been received from Mr. Dunston, county councillor, stating that he was glad to be able to inform the council that he had been instrumental first on the Highway Committee and next in the county council in getting a resolution passed declaring the Great North road, from the Doncaster borough boundary to Bawtry, to be a main road under the Locomotive Act, 1878, and he wished to express his thanks to the clerk and the surveyor (Mr. W. R. Crabtree) for the assistance given to him.

Hackney B.C.—The council have approved a scheme for a considerable widening on the eastern side of Kingsland-road, between Dalston-lane and Forest-road. The necessary land is to be given by the governors of St. Bartholomew's Hospital, with the consent of the Charity Commissioners.

Hampshire C.C.—For the coming year it is estimated that main roads will cost £94,639, or a decrease of £26,810, chiefly due to the postponement of wood block paving at Cosham. The sum left for road maintenance will be £81,822, against £81,813 last year. The expenditure on the old urban district roads is estimated at £20,501, or an increase of £2,237. The estimates include £27,000 to be spent on making good the roads damaged by military traffic, which sum is expected to be paid by the military authorities. An application is to be made to the Road Board for a grant towards surface road improvements.

Lymington R.D.C.—A letter has been received from the War Department through the Road Board agreeing to meet the council with respect to the cost of certain road improvements for military purposes.

Mansfield T.C.—The Local Government Board have intimated that they would offer no objection to the arrangement proposed for the acquisition by the council of property in Albert-street for street improvement—viz., that the property should be surrendered to the corporation, and that the owner should lend £1,000 to the corporation at £4 10s. per cent. This arrangement has been confirmed.

St. Austell U.D.C.—It is proposed to carry out an improvement in High Cross-street, at an estimated cost of £1,200.

Shepshed U.D.C.—The question of improvements to a number of footpaths has been referred to the surveyor, Mr. J. G. Foston, for report.

Southgate U.D.C.—It is proposed to effect improvements at Chase Side, and the corner of Green-lanes and Hedge-lane.

Sunderland T.C.—An improvement scheme is to be carried out at the corner of Dock-street East, and a new road constructed from Spring Garden-lane into Church-street.

Ticehurst R.D.C.—With regard to the advisability of allowing any of the roadmen off for haymaking and harvesting, the Highways Committee reported that the council had seventeen men working. Each man had about 6 miles of road on an average to look after, and the surveyor considered that this was quite as much as any man could fairly manage. The county council men, he was told, had only 2 miles each to look after. They had contracted to take 6,000 gallons of tar, which the surveyor had thought would cover about 3 miles, and if he kept the men and did not let any of them off he would be able to get the tarring done. The committee were of opinion that the tar was an advantage to the rates as well as to the roads, and they thought it would be better to continue tarring and keep the men on the roads. As regarded the question of wages, the committee understood the county council men had had the wages of their men raised 2s., and they recommended a similar increase to the rural council's workmen. This the council agreed to, the other recommendations contained in the report being also approved.

Twickenham U.D.C.—The surveyor, Mr. F. W. Pearce, has received instructions to proceed with the scheme for widening and improving Duck's-walk, the estimated cost of which is £250.

Uxbridge R.D.C.—Negotiations are proceeding with the Road Board with regard to road improvements in Northolt for military purposes.

West Lancashire R.D.C.—The county council have sanctioned a contribution of £100 towards the cost, estimated at £312, of the reconstruction of a length of road at Melling Point.

Wilts C.C.—The total cost of the main roads which the War Office requires to be repaired now amounts to £62,000. In regard to the council's own repairs they have tried to arrange that the expenditure should not exceed that of last year. Owing to the increased cost of living the sum of £500 has been set aside to meet additional wages of the roadmen, so that the actual expenditure will exceed that of last year by that amount.

SEWERAGE AND SEWAGE DISPOSAL.

Cricklade and Wootton Bassett R.D.C. The proposed sewage disposal scheme for Wootton Bassett, which is estimated to cost £3,350, has been referred back to the parish council for reconsideration and report.

Doncaster R.D.C.—It has been agreed to take up a loan of £1,063 for works of sewerage and sewage disposal.

Farnborough R.D.C.—It is proposed to carry out a drainage scheme for the parish of Radway.

Hursley R.D.C.—The Local Government Board have sanctioned the purchase of land at Chandler's Ford by the council for sewage outfall works.

Rugby R.D.C.—Sewage disposal schemes for Clifton and Newbold-on-Avon are under consideration.

Thorne R.D.C.—The question of a sewage scheme for Stainforth has been referred to a special committee for consideration.

WATER, GAS, AND ELECTRICITY.

Basingstoke T.C.—Loans amounting to £6,300 are to be taken up for extensions to the electricity system.

Birmingham T.C.—The council on Tuesday passed a resolution increasing the price of gas by 3d. per 1,000 cub. ft., to take effect from the June reading of the meters, and also a slight variation in the quantity of gas supplied through prepayment meters. The reason the council felt impelled to make the increase was mainly the large increase in the cost of gas coal and gas oil, and an advance in the wages of the workmen. Another contributing factor was the decline in the market for residuals, and further causes were the increases in the income-tax and the local assessment. —The nett balance of the electricity undertaking was £60,383, of which it is proposed to pay £35,385 to the credit of the rates, the largest sum thus paid in the history of the undertaking.

Bosmere and Claydon R.D.C.—It was reported that Mr. Child, a water diviner, had prospected for water at Barking Tye, Creeting Bottoms and Middlewood Green, and marked with stakes the points at which water might be found. The council decided that information as to the prospecting and particulars as to obtaining water supplies should be communicated to the parish councils of the respective parishes, and they should be requested to state their views on water supplies being provided by means of wells constructed at the points recommended by Mr. Child.

Burnham (Somerset) U.D.C.—The council have approved the scheme of the surveyor, Mr. W. H. Chowins, for an improved water supply. It is proposed to provide an iron main and a larger reservoir at an estimated cost of £4,000.

Cardiff T.C.—It is announced that the Waterworks Committee have temporarily suspended the following works: Outlet from Lisvane reservoir, Lisvane to Heath, loan sanctioned £13,443, and Heath extensions service reservoir £17,046.

Coventry T.C.—The available surplus of the gas undertaking for the last financial year was £5,084. It was recommended that this amount be carried forward. It was pointed out that there was a decrease in the profit of over £12,000, due to the reduced value of residuals and loss of revenue owing to the price of gas having been reduced a year ago by 2d. per 1,000 to users of slot meters. There had been an increased consumption of gas, and slot-meter consumers took one-third of the whole output. The great increase in the price of coal would be felt severely during the next two or three years.

Derby T.C.—In consequence of the large increase in the price of coal, the Electric Lighting Committee recommend that 10 per cent be added to the present charges for electricity. They take this course in order to avoid a loss on the working of the undertaking, but they point out that the additional revenue will not wholly cover the higher expenditure.

Hereford T.C.—The council on Tuesday decided that, owing to the increased cost of coal and labour, the price of gas should be increased by 3d. per 1,000 cub. ft., commencing September next. Further, owing to the increased cost of production and decreased consumption, it was resolved to make an all-round increase of 10 per cent on present prices for electricity, except in cases where prices are fixed by contract.

Keynsham R.D.C.—Inquiries are being made of the Clutton Rural District Council if they are willing to grant a water supply, and on what terms.

Leicester T.C.—In view of the small profit on the last half-year's working and the large increase in the cost of coal, it has been decided to increase the price of gas by 4d. per 1,000 cub. ft. for all purposes. It is estimated that an additional £14,000 will have to be provided for.

Nuneaton T.C.—The question of taking over ninety-seven gas lamps from the gas company in streets where electric cables have been laid is under consideration.

Port Glasgow T.C.—The council are seeking powers by way of Provisional Order (unopposed) for the provision of new gasworks.

Salford T.C.—The council on Wednesday approved a resolution of the Electricity Committee recommending that the charges to all consumers of electricity for lighting and power should be increased by 7½ per cent as from July 1st.

Upton-on-Severn R.D.C.—The Upton Water Committee are pressing the council to complete the water supply scheme, at an estimated cost of £5,000.

West Bromwich T.C.—The nett profit of the gas undertaking for the year ended March 31st was £1,307. The electricity undertaking earned a nett profit of £877.

Willesden U.D.C.—The Electricity Committee recommend the council to obtain authority from the Local Government Board to raise part of the loan of £20,000 already sanctioned for the provision of mains and services.

MISCELLANEOUS.

Dundee T.C. The possibility of a municipal analine dye industry being established in Dundee in the near future was referred to recently after an inspection by members of the council of the tar distillation plant works at Fish Dock-road and the vertical retorts at the gasworks. Lord Provost Don stated that personally he was prepared to go a good deal further than he once was in the way of municipal enterprise. If the town council did not make the dyes they could certainly sell the products for making them.

Birmingham T.C.—At the council meeting on Tuesday, Mr. G. Cadbury junr., drew attention to the difference in the cost of running between trams and motor 'buses, and declared the latter were 50 per cent more costly than the trams. In addition they were a heavy strain upon the roads, and caused increased expense in that direction. The sooner the 'buses were taken off and replaced by trams the better he would be pleased. Mr. H. Barrow, chairman of the Tramways Committee, said he agreed generally with what had been said about the cost of running the 'buses, but he would like to point out that those on the Harborne route had only been running during the winter months so far as the council were concerned, and it was anticipated that the cost of running during the summer would be less. It had been proved that the 'buses were not suited for macadam roads.

Tipton U.D.C. A sum of £195 is to be borrowed at 4½ per cent interest for the purchase of a new motor fire engine.

Yeovil T.C.—The Horse Committee are considering the question of purchasing a steam lorry on the hire-purchase system. The Local Government Board have refused sanction to a loan.

INSTITUTION OF WATER ENGINEERS.

TWENTIETH SUMMER GENERAL MEETING.

The twentieth summer general meeting of the Institution of Water Engineers will be held at the apartments of the Geological Society of London, Burlington House, W. (kindly lent for that purpose by the president and council of that body), on Friday, June 18th, commencing at 3 p.m.

The following papers will be read and discussed:—

(1) "The Effect of Spring upon Water-levels in the Chalk of Eastern Surrey," by Henry Dewey, F.G.S. (H.M. Geological Survey).

(2) "The Hydrological Conditions of Newton's East Yorkshire," by Percy Griffith, M.INST.C.E., F.G.S.

PROGRAMME.

The chair will be taken by the retiring president (Mr. Thomas Molyneux), and the minutes of the nineteenth winter general meeting, held in London on December 11, 1914, will be read and put for confirmation.

The names of members, &c., elected since the last general meeting will be announced, and those present will be welcomed by the president.

Introduction of the new president (Mr. F. W. McCullough, M.INST.C.E., J.P.), and presentation of certificate of election.

Vote of thanks to retiring president.

The new president will present a short report upon the work of the institution during the past year.

Reading and discussion of papers.

Toads Alive in Solid Rock.—Two live toads were found recently in a solid piece of rock split by workmen digging trenches for sewage purposes at Cotwall, Staffordshire.

Glasgow Corporation Tramways.—It is estimated that the decrease in traffic receipts on the Glasgow Corporation tramways during the financial year which closed on May 31st will amount to about £8,000.

FOR OTHER ADVERTISEMENTS
See End of Paper.

FAREHAM URBAN DISTRICT COUNCIL.
Wanted, in the Office of the Surveyor and Sanitary Inspector, a Temporary Assistant. Salary £85 per annum. Applicant must not be of military age (unless medically unfit). Further information may be obtained upon application to the District Council Offices, Fareham.

Applications, in envelope marked "Assistant," must be delivered to the Surveyor not later than 10th June, 1915. (2,600)

PERSONAL.

Mr. P. M. Gannon, of Navan, has on Monday last appointed assistant county surveyor for the Navan district of Westmeath, at a salary of £100 per annum.

Mr. G. H. Webb, assistant to the surveyor to the Aldershot Urban District Council, having almost completed the supervision of the scheme of sewerage reconstruction, has obtained leave to join the colours, a councillor observing that he deserved every commendation for his patriotic spirit.

Mr. D. A. Pearson, highways surveyor to the Bicester Urban District Council, has had his salary increased by £20 per annum, and at the same time the council expressed their appreciation of his attention to duty, and of the efficiency in the several departments that come under his control.

Mr. John Henry Hanson, M.INST.C.E., senior partner in the firm of Messrs. Abbey & Hanson, land agents and valuers, of Huddersfield, has been elected president of the Surveyors' Institution in succession to Mr. H. Chatfield Clarke, and was installed in the chair at the annual general meeting on Monday evening.

Mr. Hugh Owen, who for nearly forty years was borough surveyor and rate collector of Flint, and for twenty-six years secretary and manager of the Flint [illegible] Water Company, died recently at his residence in Flint after a prolonged illness. He was seventy-five years of age, and a native of Coniston, but had resided in Flint nearly all his life.

Mr. A. B. M'Donald, city engineer of Glasgow, retired on Monday, after forty-five years' service with the municipality. On the death of Mr. John Carrick, in 1890, the offices of city engineer and master of works, both of which that gentleman had held, were separated, and in October of that year Mr. M'Donald was appointed city engineer. On Monday afternoon Mr. M'Donald was the recipient of a presentation in the form of two silver rose-bowls from the staff of the office of public works. Mr. Thomas Nisbet, master of works, who presided, said that Mr. M'Donald had given faithful service to the corporation. His duties had been extremely onerous. Glasgow had nearly doubled in area, population, and valuation since Mr. M'Donald became connected with the department, and everything for which Mr. M'Donald was responsible had been efficiently done. Mr. M'Donald, in acknowledging, said that during his tenure of office the department had carried out very important and often very difficult public work, the cost of which to the citizens of Glasgow had amounted to £4,219,000.

Mr. A. Rothera, M.I.M. AND CO.E., engineer and surveyor to the Liversedge Urban District Council, has been appointed to the position of engineer and surveyor to the newly constituted urban district of Spenborough, which is an amalgamation of the urban districts of Cleckheaton, Gomersal and Liversedge. Mr. Rothera has been surveyor at Liversedge for the past 4½ years. The new council is the largest in Yorkshire, and has a population of 31,323 (1911), an acreage of 4,983, and a rateable value of about £140,000. There are about 36 miles of main and other roads. The new district possesses seven sewage works, at [illegible] which the sewage from the major part of the three amalgamated districts has been treated for some years, and where daily, in dry weather, about 1,250,000 gallons of sewage is purified. Other possessions are two town halls, two cemeteries, two central depots, park and recreation ground, electricity station, two destructors, secondary and technical school, mortuary, public baths, fire station, water mains and gasworks, together with interests in three infectious diseases hospitals. The district is well sewered, possesses a variety of manufactories, is in the centre of the Spen Valley, is a Parliamentary centre, and there is an abundance of building land in the most healthful part of the district ready to develop on garden city lines. The district of Liversedge and the neighbourhood is the scene of some of the novels written by Charlotte Brontë—particularly "Shirley"—and the family used to reside there during the Rev. Patrick Brontë's vicariate at Hartshead.

The Safety of Reservoirs.—The Metropolitan Water Board have decided that during the war it was inadvisable to let, as has been the practice, the surface of covered reservoirs to lawn tennis and other sports clubs. It is thought undesirable that anybody except the members of the board and the staff should at the present time have access to the works.

Institution of Municipal Engineers.

A VISIT TO DUNSTABLE.

Members of the Eastern, North-Eastern and South-Eastern Districts of the Institution of Municipal Engineers paid a visit of inspection to the ancient borough of Dunstable on Saturday, and undertook a tour of the town and neighbourhood. Members and their friends met at the town hall at 1.30 p.m., and were cordially welcomed by the mayor (Councillor F. T. Garrett), who was accompanied by the town clerk (Mr. C. C. S. Benning). There were also present: Messrs. W. Matthews Jones (president of the institution), Harold Pickering (Luton), F. R. Chapman (Bedford), J. C. Nicholls (Newport Pagnell), E. J. Saunders (Leighton Buzzard), E. Pollard (Leighton Buzzard), W. Mann (Dunstable), G. Simcox (South Mimms), R. Tear (Luton), W. F. Wilkins (Dunstable), L. Foster (Ampthill), T. G. Mustafa (London), T. E. Dodds (London); Councillors B. Hartop (chairman, Luton Rural District Council) and E. G. Blow (Luton Rural District Council); G. Belson Chilvers (hon. secretary, Eastern and North-Eastern Districts of the institution), and B. Wyand (secretary of the institution).

The Mayor said he had the greatest pleasure in bidding the members a most hearty welcome to the old town of Dunstable. They were meeting in a town with many historical associations. Not only was it situated at the intersection of those old Roman roads the Watling-street and the Icknield Way, but it was a town with a very old franchise. If not the oldest, it was certainly one of the oldest municipalities in the country, its first Charter being granted to a Company of Priors by Henry I. in about 1100. The town's history went back far beyond anything in the nature of municipal authorities or institutions. In the immediate neighbourhood evidences were constantly arising that primæval men and beasts existed on the hills many centuries before the Christian era. Traces were frequently found of their skill in making stone implements and weapons, and there was no doubt that men existed there soon after the glacial period and the disappearance of the icebergs. The old church was of sufficient interest to occupy a single afternoon, while on the Downs they had the remains of the huts or cave dwellings of the ancient Britons. He could place before them accounts of many discoveries at the old Brito-Roman encampment at Maiden Bower, which they were visiting, and which had never been thoroughly investigated. If excavations could be made at the Maiden Bower and its vicinity he was sure some interesting relics of the past ages would be found there.

The President briefly thanked the mayor for his welcome, and the party then commenced their tour in motor cars.

DUNSTABLE SEWAGE WORKS.

A visit was first paid to the corporation sewage farm, about 1½ miles from the northern end of the town, the visitors being shown round by Mr. W. F. Wilkins, the borough surveyor, who explained the details of the works in a short paper.

The farm is situated about 1½ miles from the northern end of the town and in the Luton rural district, the whole of the sewage being conveyed by gravitation. The borough outfall sewer is laid along the main road, known as Watling-street. The total area of the farm is 45 acres, the greater portion of the subsoil being clay, chalk being found at the southern end, where the filters and tanks are situated. There is an average of from 12 to 14 in. of top soil.

On reaching the farm the sewage passes through screening chambers, detritus tanks and sedimentation tanks. From these the partially purified liquid is discharged on to filters by means of floating arms and a dosing chamber, through a large humus tank, and then finally by an earthen grip and 6-in. pipes to the brook. After this treatment excellent samples are obtained. In heavy storms the excess water overflows to a storm-water chamber and then passes by a main carrier to a storm-water bed and over grass land. The storm-water tank is formed with soil, but, nevertheless, good results are obtained.

The present plant was put down in 1910-11, at a cost of £6,250, the engineers being Messrs. J. Diggle & Son, of Westminster, and is designed to deal with a population of 20,000. The then existing detritus tanks were incorporated into the scheme, of which the following are brief particulars: Screening Chambers: These are in duplicate and provided with ½-in. screens. Detritus Tanks: These are 19 ft. by 15 ft. Sedimentation Tanks: There are two tanks, each 51 ft. long by 31 ft. wide, with a depth varying from 5 ft. 6 in. to 6 ft. 6 in., each capable of holding about one-third of a day's flow. Dosing Chamber: This is fitted with a Stone's syphon, which discharges the effluent on to the filters by separate pipes controlled by valves. Filters: There are four filters, each 60-ft. diameter by 9 ft. in depth, fitted with Ames-Crosta revolving sprinklers. The filtering media consists of 12 in. of 6-in., 2 ft. of 3-in., and the remainder of 1-in. gas clinker, each filter being enclosed in pigeon-holed walls, 9 ft. in height. Two radiating rows of 4-in. perforated pipes are laid in each filter for better aëration. From a first observation on the ground it might be thought that the sewage passes over the top filters first and then on to the lower ones. This is, however, not the case, each filter being used separately.

The average area of ground used for irrigation at one time is about 8 acres, the remainder being farmed. The crops grown average about 9 acres each of oats and wheat, 4 acres each of clover and mangolds, and 4½ acres of beans, with about 12 acres of grass used for hay and cattle feeding, with occasional irriga-

Totternhoe Cottages, Luton.

tion. From six to ten head of cattle are fed and fattened for sale annually. The whole of the land is underdrained.

The area served by the farm is the borough of Dunstable, 892 acres and 8,057 population, and part of the parish of Houghton Regis, 205 acres and 1,242 population; a total of 1,097 acres and 9,299 population. The dry-weather flow is estimated at about 200,000 gallons.

Returning to the gasworks, the party were met by Mr. G. F. Cutting, manager to the Gas and Water Company, and under his guidance made an inspection of the undertaking.

The Stone Age camp of Maiden Bower, a short distance across the fields, was next visited, and the five original entrances through the ramparts which still remain were pointed out. The camp has an area of over 10 acres, and was originally surrounded by a deep ditch. Here it is that remains of Neolithic man and of the Bronze Age have been discovered. Being met by the motor cars in the Green Way, an ancient British road, and the precursor of the Roman road which passes through Dunstable, the party were driven to the Totternhoe Knolls, from the top of which a magnificent view of the surrounding country was obtained. The huge knoll is an ancient British look-out position and fine beacon, and the depression made for the furnace on the top is clearly visible. The hill is 524 ft. above sea level.

LUTON RURAL COUNCIL'S COTTAGES.

Passing through Totternhoe, a halt was made to inspect four cottages recently built by the Luton Rural District Council from plans prepared by their surveyor, Mr. H. Pickering.

The visitors were very favourably impressed by the appearance and accommodation of these cottages, and the price at which they were erected. They are built of [illegible]

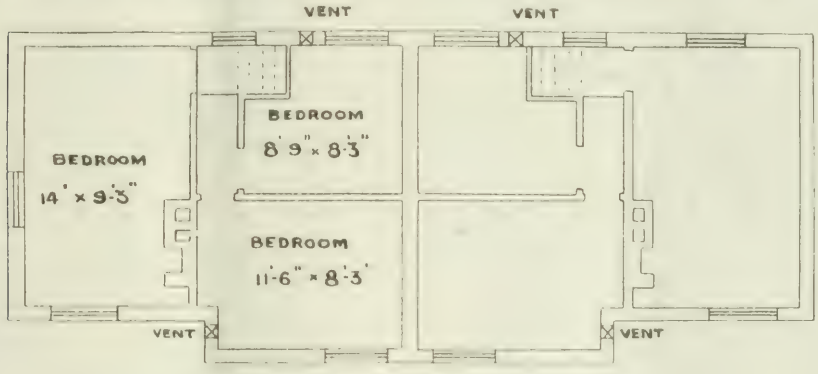
given free by Earl Brownlow. The site is pleasing and very suitable on rising ground at foot of hill (chalk), with south-western aspect and sheltered from northerly and easterly winds by the hill. Externally walls are 9 in. brickwork, concreted and pebble-dashed, with hand-made tiles. Each cottage has a living-room, kitchen, and one scullery downstairs, and three bedrooms upstairs. The dimensions of the rooms are as follows: Living room, 13ft. 6in. by 11ft. 6in.; scullery, 14ft. by 9ft. 3in.; bedroom (1) 11ft. by 9ft. 3in., (2) 11 ft. 6 in. by 8 ft. 3 in., (3) 8 ft. 9 in. by 8 ft. 3 in.; also to each cottage pail closet and coal store, of similar materials as cottages, but detached.

The [illegible] cost of cottages, including [illegible] water supply and [illegible] was £[illegible] or £[illegible] per 1649 all the buildings (including [illegible] £[illegible]

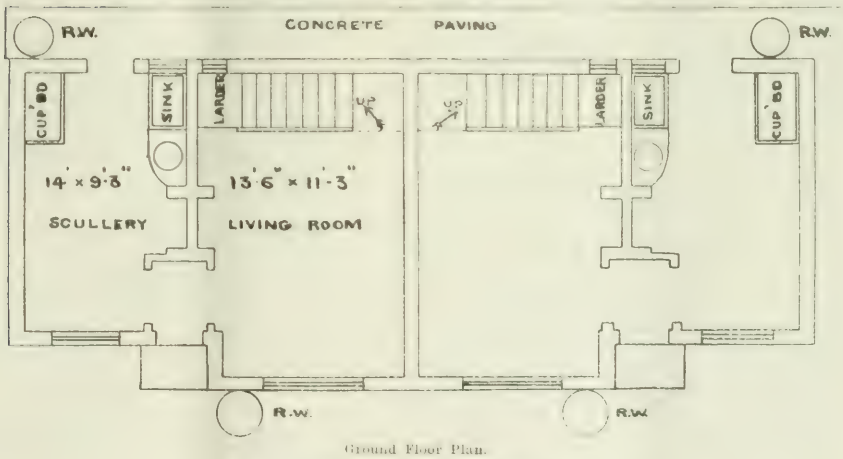
could not possibly attempt to build on those lines at Chester. He had also been very much interested in the old Roman camps they visited, which anyone interested in history would agree were well worth seeing. Members of the Institution of Municipal Engineers [illegible] had on that occasion, but their pleasure had been [illegible] They liked to go to various towns and pick up knowledge from other people, and [illegible] a good deal that day.

The Mayor assured Mr. Jones that it gave the Mayoress and himself much pleasure to entertain them, and he hoped that would not be the last occasion on which they would visit Dunstable.

Mr. B. Hartop, chairman of the Luton Rural District Council, thanked Mr. Jones for his remarks about the Totternhoe cottages, and said that, although the



First Floor Plan.



Ground Floor Plan.

Totternhoe Cottages, Luton.

of water supply (draw well sunk 50 ft. into chalk) and fencing, £19. The cottages are let at weekly rental of 3s. 7d. (rates inclusive).

The waterworks at Dunstable were also visited, and the company were enabled to see the recently installed engine at work, this pumping 30,000 gallons per hour.

Arriving back at the town hall, they were entertained to tea by the Mayoress, to whom the president afterwards voiced the thanks of the company. He also thanked the Mayor and Messrs. Wilkins and Pickering for a most enjoyable afternoon. They had not only had the pleasure of seeing the beautiful scenery and town of Dunstable, but also some extremely interesting works. Alluding to the cottages they had inspected at Totternhoe, the president said he believed these were the cheapest he had seen built in this country, and when they remembered the pleasant situation and the amount of land attached to them he could hardly understand how it had been found possible to let them at 3s. 7d. per week. They council had the land given free, they were much indebted to their surveyor (Mr. Pickering) for the able manner in which he carried out the scheme. Without wishing to flatter those present, he could say that the general public little knew how much they were indebted to surveyors. Public officials were usually looked upon as gentlemen who did nothing but ask for an increase of salary; but those who happened to be behind the scenes, and knew a little about matters connected with the health of the community, were aware of the enormous amount of work surveyors had to perform. In this most of them were sincere, and did their best without thought of reward.

Messrs. Pickering and Wilkins also suitably replied.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

FLIES AND DISEASE.

Reference has been made recently in these pages to the risk of the transmission of disease by flies, and all those who are acquainted with the subject are agreed that the most efficient remedy is to stop the breeding of the fly, preventing the accumulation of filth and refuse. Much time will elapse before the public as a whole can be made to realise the importance of the means of protection from disease, but meanwhile those who recognise their duty and pay more than lip service to the maxim that cleanliness is next to godliness may often save their neighbours as well as themselves from much suffering.

Under these circumstances it is important to have some means of preventing flies from entering houses and settling on food, not only in ordinary houses, but particularly in hospitals, camps, and the many buildings in which numbers of persons, infirm, ailing and war prisoners are housed.

For this purpose the use of Heppell's anti-fly spray appears to be a most efficient method. It is a non-poisonous solution of chemical and vegetable insecticides combined in an agreeable form, and is supplied in small bottles each provided with a powerful spray, which enables the user to reach and penetrate corners and crevices, and to catch the flies either resting or in flight. It should be used freely round window-frames and doors; carpets should be sprinkled with the spray, and walls washed with a solution of three cupfuls to each bucket of water.

Gauze or curtains saturated with the anti-fly spray should be hung over larder windows and doors, and saucers containing the solution, with the addition of a lump of sugar, may be put about in places where the flies are particularly troublesome without any risk to domestic pets. In all cases where the flies are particularly prolific the dustbin, which is a favourite breeding-place, should be saturated with the spray, with the addition of a large handful of borax.

The solution has been tested and approved in restaurants, hotels and riverside resorts, and when required for large areas it can be obtained in a concentrated form for dilution and use with a larger sprayer.

The anti-fly spray can be obtained from Heppell & Co., pharmacists, &c., 73 Knightsbridge, S.W., or any of their branches, in two sizes, at 3s. 6d. and 5s. 6d., and special quotations would be given for the requirements of local authorities, hospitals, camps, sanatoria, and other institutions.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

ANNUAL GENERAL MEETING.

The forty-second annual general meeting of the Institution will be held at the Institution of Civil Engineers, Great George-street, Westminster, on Thursday and Friday, June 24th and 25th, followed by visits on Saturday, June 26th.

PROGRAMME.

Thursday, June 24th.

9.30 a.m.—Meeting of subscribers to the Orphan Fund.

10 a.m.—Council meeting.

10.30 a.m.—Members will assemble in meeting room and will be welcomed by Mr. County Alderman W. Regester, J.P. (chairman, Middlesex County Council).

ANNUAL GENERAL MEETING.

Chairman: The outgoing president, Mr. J. S. Pickering, M.Inst.C.E..

Minutes of last annual general meeting.
Annual report of the council (to be taken as read).
Presentation of premiums.
Election of auditors and scrutineers.
Installation of Mr. H. T. Wakelam, M.Inst.C.E., as president.
Presidential address.

Chairman: Mr. H. T. Wakelam, M.Inst.C.E. (President).

12 noon.—Address on Town Planning by Mr. Raymond Unwin, Chief Town Planning Assistant, Local Government Board).

1 p.m.—Adjournment for lunch.

2 p.m. Discussion on the following papers (to be taken as read):

(1) "Mechanical Traction for Municipal Work," by E. J. Elford, M.Inst.C.E., borough surveyor, Southend-on-Sea.

(2) "Haulage by Mechanical Means," by T. W. E. Higgens, Assoc.M.Inst.C.E., borough engineer, Chelsea.

(3) "The Use of Motor Vehicles in Haulage of Materials on the Highway," by F. W. Smart, chief engineering assistant, Bedfordshire.

(4) "Notes on Sewage Treatment by Forced Aëration," by J. P. Wakeford, M.Inst.C.E., city surveyor, Wakefield.

(5) "Some Recent Experiences in the Surfacing and Maintenance of Roads, particularly on a Clay Subsoil," by J. A. Webb, engineer and surveyor, Hendon Rural District Council.

(6) "Resurfacing Roadways with Tarmacadam," by N. Greenshields, Assoc.M.Inst.C.E., borough engineer, Bedford.

(7) "The New British Sewage, Drainage and Drainage Ventilation Systems of the Twentieth Century," by I. Shone, C.E.

(8) "The Reinstatement of Trenches," by Reginald Brown, M.Inst.C.E., surveyor to the Southall-Norwood Urban District Council.

4 p.m. Afternoon tea (by kind invitation of the president, Mr. H. T. Wakelam).

Friday, June 25th.

10 a.m.—Discussions on the following papers (to be taken as read):

(9) "The Improvement and Maintenance of Highways in connection with Modern Traffic Conditions," by C. F. Gettings, M.Inst.C.E., county surveyor, Worcestershire.

(10) "Improvement and Maintenance of Highways," by J. S. Brodie, M.Inst.C.E., borough engineer, Blackpool.

(11) "Reinforced Concrete for Roads, Sewerage, &c.," by A. E. Collins, M.Inst.C.E., city engineer, Norwich.

(12) "Tar, Pitch and Bitumen in Road Construction," by A. Dryland, M.Inst.C.E., county surveyor, Surrey.

(13) "Fire Brigade Organisation and Equipment," by W. A. Farnham, engineer and surveyor, Foots Cray Urban District Council.

(14) "Protection of Ancient Buildings," by W. A. Forsyth, F.R.I.B.A.

1 p.m.—Adjournment for lunch.

2 p.m.—Discussion continued.

4 p.m.—Opening of Road Exhibition, Horticultural Hall, Vincent-square, S.W.

6.45 p.m.—Reception in the Oak Room of the Hotel Cecil by the president.

7.15 p.m.—Annual dinner in the Victoria Hall, Hotel Cecil. (Tickets 7s. 6d. each, exclusive of wine.)

Saturday, June 26th

VISITS.

VISIT A.—Kingston Sewage Disposal Works and Canbury Gardens.

9 a.m.—Assemble at Westminster Bridge Pier, and proceed by launch "King" (tickets 3s. 6d. each) to Karsino Hotel, Hampton Court.

1.15 p.m.—Lunch at Karsino (by kind invitation of the president, Mr. H. T. Wakelam).

2.0 p.m. Launch leaves the Karsino Hotel for Kingston.

3.30 p.m. Disembark at Kingston, and visit sewage works and Canbury Gardens.

5 p.m.—Return by train to London.

VISIT B.—Southwark Bridge Reconstruction.

10 a.m.—Assemble at City end of Southwark Bridge.

The work comprises the removal of the old Southwark Bridge, and the erection on the same site of a new bridge with improved gradients. The old Southwark Bridge consisted of three cast-iron arches, the largest span being 240 ft. The bridge was designed by Rennie, and was opened to public traffic in 1819. The Corporation of London decided upon its removal on account of the steepness of its gradients, 1 in 18 on the City

... and the abutments piers were out of alignment with the other bridges in the district. The new bridge consists of five steel arches and the contract price is nearly £12,000. At the present stage the old bridge has been entirely removed, and the foundations for the new piers are in hand. Each of the new piers will be of stone, and will be founded on caissons sunk into the bed of the river. The caissons will be sunk under compressed air, and as they sink the piers will ... will be constructed with seven ribs, and upon these the steel flooring supporting the roadway and footpaths will be laid. The width between parapets will be 55 ft., the roadway being 35 ft. in width and the footpaths [illegible] The bridge will be 42 ft. 6 in. wide.

VISIT OF NEW UNDERGROUND TUBE FROM GENERAL POST OFFICE TO PADDINGTON.

... assembled at the operating centre, No. 16A South Wharf-road, adjoining the Grand Junction Canal, at Paddington. Represented at Mr. Balfour's Party [illegible] been appointed by the Postmaster-General to inspect the mechanical equipment of the railway [illegible] works.

Ladies are not invited to attend the meeting, owing to the general dangers ...

SOUTHALL MEETING.

A meeting of the London District will be held in the Town Hall, Southall, to-morrow (Saturday).

J. A. WEBB,
Hon. District Secretary.

Great Stanmore.

AYR MEETING.

The annual Scottish District meeting of the institution will be held at Ayr [illegible] and [illegible]

DAVID A. DONALD,
Hon. District Secretary.

Great [illegible]

MATLOCK MEETING.

The arrangements for the institution meeting to be held at Matlock on June 12th include visits to the new sewage works, the brine and electric baths, and other undertakings.

J. W. DUDLEY ROBINSON,
Secretary.

INSTITUTION OF MUNICIPAL ENGINEERS.

COUNCIL MEETING.

At a meeting of the council held in London on May 26th the following applicants were recommended for admission:—

To Membership: Messrs. B. G. Michel, municipal engineer, Carleton-place, Ontario, and S. H. Davies, Wirral Urban District Council.

To Associate membership: Mr. F. C. Noble, surveyor, Chichester.

Transferred to Membership: Messrs. E. G. Stimson, city surveyor's office, Sydney, and S. L. Kumar, irrigation engineer, Bannu, India.

New Members, &c.—From the applicants recommended for admission at the last meeting two members and one associate-member were elected.

Mutual Aid and Defence Fund.—A committee, consisting of Messrs. F. S. Cutler, Winter Gray, T. Mundy and John Taylor, was appointed to consider the question of the administration of this fund.

National Road Conference and Exhibition.—Messrs. Horace Boot, E. A. Stickland, T. Mundy, F. S. Cutler, H. J. Farmer and W. Finch were nominated to represent the institution at this conference, which is to be held June 25th to July 1st. An informal meeting of the institution will be held at the council offices on June 30th, at 4 o'clock, and members are invited to attend and visit the exhibition afterwards.

Nominations for ordinary members of council must be deposited with the secretary by June 20th, and forms for the purpose may be obtained on application.

The next meeting of the council will be held in London on Wednesday, June 30th, at 5.30 p.m., during the week of the National Road Conference. The July ... meeting will be held at Newcastle-on-Tyne.

Members who have not paid the current year's sub... possible.

B. WYATT,
Secretary.
39 Victoria-street.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

MANCHESTER MEETING.

By the kind permission of the Manchester Corporation, a visit to their sewage disposal works at Davyhulme (Urmston) has been arranged for Saturday, June 5th, at 3 p.m.

The works are about 1 mile from Urmston Station.

ROYAL SANITARY INSTITUTE.

BRISTOL MEETING.

A ... meeting ... the Council ... Bristol, on Friday, June 11th, in the Civil Court, Guildhall, Bristol, when a discussion, to be opened by Lieutenant-Colonel D. S. Davies, medical officer of health, Bristol, and Mr. L. S. Mackenzie, ASSOC.M.INST.C.E., city engineer, Bristol, will take place on "The Co-ordination of Military and Civil Sanitary Services in War Time."

The chair will be taken at 11 a.m. by Lieutenant-Colonel H. R. Kenwood, M.B., D.P.H.

1.15 p.m.—Luncheon at Stuckey's Restaurant, Wine-street, Bristol. (2s. 6d. each.)

2.30 p.m.—Proceed by motor char-à-banc from top of ... Bath new sewage works, and to Twerton to inspect the pumping station. The party will be conducted over the works by Mr. W. H. ... (Tickets for motor, 2s. 3d.)

5.15 p.m. Tea at the Old Red House, New Bond-street, Bath. (Tickets for tea, 1s. 3d. each.)

6.15 p.m.—Motors leave Bath for Bristol.

Tickets for the admission of visitors may be had on application to Lieutenant-Colonel D. S. Davies, M.D., medical officer of health, Prince-street, Bristol, or of Mr. T. J. Moss-Flower, Carlton Chambers, 25 Baldwin-street, Bristol, who is acting as hon. local secretary of the meeting, and of Mr. E. White Wallis, secretary.

YEOVIL MEETING.

A ... meeting ... will be held at Yeovil, on Wednesday, June 9th, when a discussion on "Water Supplies to Rural and Small Urban Areas" will be opened by Dr. W. G. Savage, county medical officer ...

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but these responsible for their despatch are recommended to arrange that they reach* THE STEVENS *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

ENGINEERING ASSISTANTS.—June 7th.—Ilkley Urban District Council. £120 per annum.—The Engineer and Surveyor.

ROAD FOREMAN.—June 7th.—Brighouse Town Council. 45s. per week.—Borough Engineer.

REFUSE DESTRUCTOR SUPERINTENDENT.—June 7th.—Corporation of Coventry. £3 5s. per week.—Mr. J. E. Swindlehurst, city engineer and surveyor.

SURVEYOR AND WATER ENGINEER.—June 8th.—Bridgwater Rural District Council. £250—£325.—Mr. T. M. Read, clerk, Rural District Council Offices, Bridgwater.

CLERK OF WORKS.—June 8th.—Llantrisant and Llantwit Fardre Rural District Council. £3 3s. per week.—Mr. W. Spickett, clerk, Pontypridd.

WORKING WATERWORKS FOREMAN.—June 8th. ... Urban District Council. 30s.–40s. per week.—Mr. James A. Hutchinson, waterworks engineer and manager, Town Hall.

BOROUGH ELECTRICAL ENGINEER.—June 9th.—West Hartlepool Town Council. £400 a year.—Mr. H. Simpson, town clerk.

INSPECTOR OF NUISANCES.—June 11th.—Spenborough Urban District Council. £150 a year.—Mr. John H. Linfield, clerk, Town Hall, Cleckheaton.

GAS ENGINEER.—June 12th.—Stoke-on-Trent Corporation. £500 £700 per annum. Mr. E. B. Sharpley, town clerk.

BOROUGH SURVEYOR.—June 12th. Corporation of Wenlock. £200 per annum. Mr. F. H. Potts, town clerk.

BOROUGH ENGINEER AND SURVEYOR.—June 14th.—Woolwich Borough Council. £500—£650.—Mr. Arthur B. Bryceson, town clerk.

INSPECTOR OF NUISANCES.—June 14th.—Colwyn Bay Urban District Council. £150 per annum.—Mr. J. Amphlett, clerk.

DISTRICT SURVEYORS (2).—June 18th.—London County Council.—The Clerk, County Hall, Spring-gardens, S.W.

ROAD SURVEYOR.—June 23rd.—Denbighshire County Council. £100 per annum, with travelling expenses.—Mr. W. R. Evans, clerk, County Offices, Ruthin.

TEMPORARY CLERK.—Corporation of Cheltenham.—Borough Engineer, Municipal Offices, Cheltenham

SANITARY INSPECTOR. Finsbury Borough Council. £3 per week. Medical Officer of Health, Town Hall, Rosebery-avenue, London, E.C.

DRAUGHTSMAN.—Public Works Department, Government of the Gold Coast. £250—£300.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ASSISTANT ENGINEERS.—Public Works Department, Government of the Gold Coast. £350—£400.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

GRIMSBY. June 5th. For alterations to "Rutland House," for the rural district council.—Mr. J. F. Wintringham, St. Mary's Chambers, Grimsby.

SOMERSET.—June 5th.—For carrying out sea defence works at Blue Anchor, near Minehead, for the county council.—Mr. Edward Stead, county surveyor, Wells.

SHORTLANDS.—June 7th.—For the construction of a subway and other contingent works, for the Metropolitan Water Board.—Chief Engineer, Savoy-street, Strand, W.C.

DROMORE.—June 8th.—For the erection of twenty cottages, for the rural district council.—The Clerk.

LAMBETH.—June 8th.—For the execution of work in connection with the painting and cleaning of the infirmary, for the Board of Guardians.—Mr. James L. Goldspink, clerk, Board Room, Brook-street, Kennington, S.E.

WOODHALL SPA. June 9th. For reconstructing a culvert, for the urban district council.—Mr. J. E. Chatterton, clerk, 4 Church-lane, Horncastle.

WEST RIDING.—June 9th.—For the construction of four shelters, for the Asylums Board.—Mr. W. E. H. Burton, architect, West Riding Asylum, Wakefield.

WOOD GREEN.—June 9th.—For the erection of a covered rifle range, for the urban district council.—The Surveyor.

GLAMORGAN.—June 12th.—For repairs and alterations to schools, for the county council.—Mr. T. Mansel-Franklen, clerk, County Hall, Cardiff.

WEST SUFFOLK.—June 14th.—For repairs at certain schools, for the Education Committee.—Mr. A. A. Hunt, county architect, 51 Abbeygate-street, Bury St. Edmunds.

CREWE.—June 15th.—For the erection of three cottages, for the corporation.—Mr. G. Eaton-Shore, borough surveyor.

GREENOCK.—June 15th.—For the erection of 150 houses, for the corporation.—Office of Public Works, Municipal Buildings.

CASTLEBAR.—June 19th.—For building four cottages, for the rural district council.—The Clerk.

ALDERSHOT.—For the re-erection of a temporary hospital. Offers invited from owners of wood or iron buildings.—Mr. F. C. Uren, surveyor.

BOOTLE.—For alterations to school lavatories, for the corporation.—Borough Engineer.

Engineering: Iron and Steel.

ROTHWELL. June 4th. For the construction of stoneware and cast-iron pipe collecting drain, with junctions, manholes and washouts, for the urban district council.—Messrs. Everard, Son & Pick, 6 Millstone-lane, Leicester.

BALLYMENA.—June 5th.—For supplying and laying cast-iron water pipes, for the urban district council.—Messrs. Swiney & Croasdaile, engineers, Avenue Chambers, Belfast.

BRIDGNORTH.—June 7th.—For water main renewal, for the corporation.—Borough Surveyor.

MAYO.—June 7th.—For the reconstruction of Sonnagh Bridge, for the county council.—The Secretary, County Council, Castlebar.

FARNBOROUGH.—June 7th.—For the supply and erection of a standard type steam disinfector and machinery, horse-drawn ambulance, and the erection of corrugated-iron disinfection station, for the urban district council.—Mr. J. E. Hargreaves, engineer and surveyor.

ISLE OF WIGHT.—June 9th.—For repairs to a bridge, for the rural district council.—Mr. L. A. Cozens, surveyor, Walmer Villa, Castle-road, Newport, I.W.

CHORLEY.—June 11th.—For the supply and fixing of hydrants, for the rural district council.—Mr. A. Jolly, surveyor, High-street.

HALIFAX.—June 12th.—For the supply and fixing of a hot-water boiler, for the Education Committee.—Mr. J. Lord, borough engineer.

YORK.—June 14th.—For the construction of two 30-in. cast-iron pipe lines, for the corporation.—Mr. F. W. Spurr, city engineer, Guildhall.

DUBLIN.—June 15th.—For the supply and erection of four Lancashire boilers, for the Office of Public Works.—Mr. H. Williams, secretary

EAST STOW.—June 16th.—For the construction of a bored well, trial pumping, and other works, for the rural district council.—Messrs. J. Taylor & Sons, engineers, Caxton House, Westminster, S.W.

MADRAS.—July 14th.—For the supply of cast-iron pipes, special castings, sluice valves and hydrants, for the corporation.—Mr. J. W. Madeley, special engineer; agents, Messrs. James Mansergh & Sons, 5 Victoria-street, Westminster, London, S.W.

RANGOON.—August 11th.—For the installation of a system of fire alarms, for the municipality.—Messrs. Ogilvy, Gillanders & Co., 67 Cornhill, London, E.C.

Gas and Electricity.

KIRKCALDY. June 14th. For the supply of 100 half-watt, 1,000-c.p. lamps and lanterns, for the corporation.—Mr. O. F. Francis, burgh electrical engineer and tramways manager, Electricity Works, Kirkcaldy.

REDDITCH.—June 14th.—For the supply of high-tension three-phase switchboard, for the urban district council.—Messrs. Handcock & Dykes, engineers, 11 Victoria-street, Westminster, S.W.

WEST HAM.—June 14th.—For the installation of the electric light and low-pressure hot-water heating apparatus, for the Education Committee.—Mr. W. Jacques, architect, 2 Fen-street, Fenchurch-street, E.C.

STOURBRIDGE.—June 15th.—For the supply of an exhauster, for the Gas Committee.—Mr. C. H. Webb, engineer and manager, Gasworks.

EDINBURGH.—June 21st.—For the supply of two 5,000-kw. turbo-alternators and condensing plant, for the corporation.—The Engineer, Dewar-place, Edinburgh.

Roads.

NEW SHOREHAM.—June 5th.—For the supply of 400 yds. of surface hand-picked land flints, or, alternatively, 400 yds. of dug pit flints, for the Harbour Trustees.—Chairman, Works Committee, Harbour Offices, Southwick.

WANDSWORTH.—June 7th.—For making up Bracken-avenue, Putney, for the borough council.—Borough Surveyor.

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They are positive in action, and by greatly improved methods of construction wear is reduced to a minimum. They give a constant flow and operate without shock. Rotoplunge Pumps represent the highest standard of mechanical science and simplicity of construction; they are without gear or valves. All parts are automatically lubricated by the water, and are easily accessible. As the outcome of several years' work the Rotoplunge has been perfected, and can therefore be purchased with the assurance that the [illegible]

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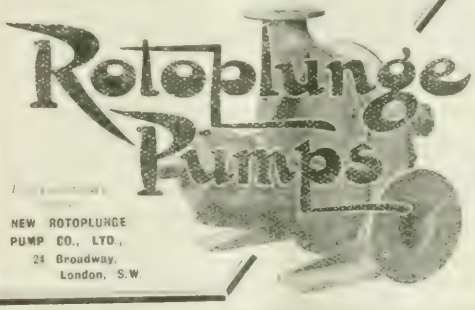

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AN APOLOGY.

The Government, during the last six months, has had first call upon our resources, orders having been received for nearly £20,000 worth of Portable Water Filters for H.M. WAR DEPARTMENT.

We are ahead of our stipulated time on this contract, and can therefore better offer our services to Public Bodies, Surveyors, and Civil Engineers, in connection with this branch of Hydraulic Engineering in which we specialise.

Advice given and complete specifications and estimates free of charge for Ejectors or Air Lifts, Water Filters, Softeners, or Sterilisers, and for all Apparatus in connection with the Raising or Purification of Sewage.

WATER LIFTING, FILTRATION, SOFTENING, STERILISING. **SEWAGE** LIFTING, PURIFYING, STERILISING.

EMLY.—June 7th.—For the supply of broken dressed tarred macadam and chippings, for the urban district council.—Mr. F. C. Heath, clerk, Emly, Wakefield.

WITHERNSEA.—June 8th.—For the construction of tar-macadam footpaths, for the urban district council.—Mr. J. H. B. Kirton, surveyor.

LEPTON.—June 9th.—For works of kerbing and channelling, for the urban district council.—Mr. J. W. Senior, surveyor.

CRANBROOK.—June 9th.—For steam rolling and scarifying, for the rural district council.—Mr. S. F. Williams, acting clerk.

EASTBOURNE.—June 9th.—For private improvement works, for the corporation.—Mr. A. E. Prescott, borough surveyor.

BOLLINGTON.—June 9th.—For the supply of 300 tons of granite macadam, for the urban district council.—Mr. S. Knight, clerk, Council Office, Bollington, near Macclesfield.

STAMFORD.—June 10th.—For the supply of 1,000 tons of broken granite, for the corporation.—Mr. F. R. Ryman, borough surveyor and engineer.

WESTMINSTER.—June 10th.—For the execution of paving works and the supply of wood blocks, for the city council.—Town Clerk.

DURHAM.—June 11th.—For the supply of about 12,000 tons of granite cubes and other size granite setts, for the county council.—Mr. Albert E. Brookes, county surveyor, Shire Hall, Durham.

TIPPERARY.—June 12th.—For the supply of four 6-ton end-tipping wagons, for the county council.—County Surveyor, Court House, Nenagh.

EAST SUSSEX.—June 14th.—For hiring steam rollers and scarifiers, for the county council.—Mr. Fred J. Wood, county surveyor, County Hall, Lewes.

TREDEGAR.—June 15th.—For the supply of 375 tons of 2½-in. granite, and 75 tons of ⅜-in. to ¾-in. granite chippings, for the urban district council.—Mr. H. J. C. Shepard, clerk.

TOTTENHAM.—June 15th.—For tar and asphalt paving repairs, for the urban district council.—The Engineer.

LEWES.—June 18th.—For road rolling and the supply of 600 tons of 2-in. broken granite and 600 tons of broken surface-picked flints, for the corporation.—Borough Surveyor.

GUILDFORD.—June 18th.—For the supply of granite, for the rural district council.—Mr. J. Anstee, surveyor.

Sanitary.

CUDWORTH.—June 7th.—For the construction of sewage disposal works, including screen chamber, detritus tanks, liquefying tanks, storm tanks, percolating filters, sludge beds and humus tanks, for the urban district council.—Mr. W. T. Lynam, engineer and surveyor, Council Offices.

BLAYDON-ON-TYNE.—June 8th.—For the removal and disposal of ashpits, for the urban district council.—Mr. R. Biggins, sanitary inspector.

SEDGEHILL.—June 8th.—For the removal of house refuse, for the urban district council.—Mr. T. Spencer, clerk.

WANDSWORTH.—June 10th.—For surface drainage at Putney Vale cemetery, for the borough council.—Mr. P. Dodd, borough engineer, 215 Balham High-road, S.W.

HAMBLEDON.—June 12th.—For the collection and removal of refuse, for the rural district council.—Mr. F. Smallpeice, clerk, 138 High-street, Guildford.

BLYTH.—June 21st.—For scavenging the village of Carlton, for the rural district council.—Mr. A. E. Hewett, 78 Highland-grove, Worksop.

Stores.

WESTMINSTER.—June 14th.—For the supply of coal, coke, gas and hot-water fittings, stoneware gullies, sewerage and drainage works, shovels, picks, sewer implements, and edge tools, for the city council. Mr. John Hunt, town clerk.

Miscellaneous.

WATERFORD.—June 11th.—For the supply of two sleeping vans and a steam drilling plant, for the county council.—Mr. J. Bowen, county surveyor, Dungarvan.

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The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

Heavy Traffic. In June last an important deputation from the County Councils Association waited upon the President of the Local Government Board for the purpose of laying before him the views of the association on problems connected with heavy traffic. Prior to this a report, based upon definite evidence as to the extent of heavy traffic throughout the country, and as to the amount of the consequent damage to roads had been prepared. This report, which has been laid before the Departmental Committee which is at present considering the whole subject, has recently been made public, and is a most interesting document. Dealing in the first place with traction engines, the report states that, of course, the amount of this traffic varies considerably in the different counties. In some, where there are quarries, brickworks, or similar industries, a very large number of traction engines run regularly over the roads to the railway stations, and this is sometimes so far recognised as a necessary part of a local industry that a few highway authorities appear to expect nothing in the way of compensation for damage done by them to the roads. The damage, however, in such cases is undoubtedly very serious indeed, and in those counties where the industry and traffic is not purely local it is strongly felt that it is unfair that the special industry benefited should not be called upon to contribute towards the extra expense. Thus in Cornwall the traffic between the mines, quarries and ports has practically destroyed the connecting roads. Berkshire, Oxfordshire, Staffordshire, and Worcestershire, among other counties, suffer very considerably from this class of traffic, but it is perhaps most severely felt in several of the Welsh counties.

The hauling of agricultural machinery by traction engines is common in most parts of the country, and is described as being most destructive to the roads, especially in the wet season. The conveyance of roundabouts and so forth to fairs is a serious item. In Lancashire, however, it appears that traction-engine traffic is almost entirely limited to the carriage of large single indivisible articles. As regards the question of increase or decrease of this class of traffic, experience seems to differ widely. In Lancashire there has been no great increase in the past fifteen years. In Middlesex it is said to be now only a minor factor. In Glamorgan also it appears to be not increasing, and in some parts there is an opinion that traction engines are giving way to heavy motors. On the other hand, in Carmarthenshire, Leicestershire and Oxfordshire, it is definitely stated to be on the increase, while there seems no indication of any appreciable decrease in the country generally. In a few counties it is stated that the main roads generally are capable of bearing this traffic, if moderate in extent, but practically nowhere, except where the roads have been reconstructed, are they considered able to bear it if continuous in character. A number of counties have given definite instances of lengths of road so seriously damaged by this traffic as to need reconstruction. In a few cases it has been possible to recover damages for "extraordinary traffic," but the existing state of the law on this point is felt to be very unsatisfactory, and but little benefit can be obtained from it. The association's suggestions that an adequate annual licence fee should be charged for traction engines, and that the daily travelling fee should be raised to at least 10s., are strongly supported by the individual county councils and their surveyors.

The report deals at length with the subject of heavy motor-traffic under five heads: (1) Private traders in their own business, (2) traders plying for hire, (3) railway companies (4) Post Office, and (5) military authorities. In regard to the first of these classes it is pointed out that the extent of this traffic depends very much on the neighbourhood of large towns. The Home Counties probably suffer the most, as such a large number of London firms send out heavy motor cars delivering goods daily over most of the roads in the surrounding country. The second and third classes cover the motor omnibuses and chars-à-banc. It is difficult without very detailed statistics to give an idea of the amount of this class of traffic in any particular area, but enough is known to show that it forms perhaps the most serious part of the problem. As regards classes (4) and (5), the Post Office run motor mail vans on definite routes over many of the principal roads of the country; and the military authorities, apart from the present abnormal conditions, run heavy motors occasionally. There is general agreement that this class of traffic does a very considerable amount of damage to the roads. Two questions thus arise—namely, how far the roads are fit to bear it, and whether anything could and should be done to render the vehicles themselves less destructive. County surveyors who were questioned on the question of speed were practically unanimously of opinion that, whereas these vehicles do very substantial damage at the present legal speed, the damage is greater as the speed is increased. To the question whether matters would be improved if rubber tyres were fitted to all heavy motors, twenty-two surveyors answered in the affirmative, one said "Not materially," and two answered "No." One was of opinion that it would diminish the damage on setts, and, to some extent, on tar-macadam, while another considered that heavy motors and omnibuses with rubber tyres (especially when grooved)

do the most damage, and yet another that, as the speed is greater when rubber tyres are used, the damage to the roads is as great as iron tyres at a less speed. One surveyor points out that it is very necessary to decide *when* a resilient tyre ceases, from wear, to be any protection to the road from the iron tyre or rim. Almost all the surveyors agree that less damage would be done if the width of iron tyres were to be increased. One points out that at present heavy motors are permitted to carry heavier loads per inch width of tyres on far smaller diameter wheels than traction engines, and to travel at greater speed, with the result that they are by far the most destructive vehicles on the roads, even when they comply strictly with the Heavy Motor Car Order, which is not by any means general. The opinion is also generally expressed that the diameter of wheels should be increased and a minimum diameter fixed. Space precludes us from dealing with the remainder of the report at present, but we hope to return to the subject next week.

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A Sewage Works Laboratory.

Although, as a general principle, it is usually accepted that a laboratory is required at every large sewage disposal works, it is doubtful whether the average person has even yet a very clear idea as to the precise need for and use of chemical examination of the sewage and its effluents, and the value of a chemist's work. Also it is more than probable that his ideas as to the arrangement of such a laboratory would be vague. The paper submitted on Saturday last by Mr. James H. Edmondson, F.C.S., chemist and manager of the Southall-Norwood sewage works, at the Eastern District meeting of the Institution of Municipal and County Engineers at Southall is therefore important. Moreover, this paper is written in such a manner as to bring forward various points which, though they may be elementary to the chemist, are not elementary to a good many engineers. Although the various treatises written by chemists deal fully with the points mentioned, they are apt to contain a mass of highly scientific matter which obscures the more simple elementary essential points which ought to be grasped by every person interested in the subject of sewage disposal before he can properly appreciate the value of the chemist's work.

It is interesting to learn that in the case of Southall-Norwood a laboratory of sufficient stability, with the lighting, ventilation, proper protection for the instruments and separate rooms as required, rendered as free as possible from vibration, with sufficient protection from cold and prevention of nuisance from dust and chemical fumes, has been erected, as stated by the author, for £50, while the necessary chemicals, apparatus and fittings cost £60. The only tests recommended by the Royal Commission on Sewage Disposal are those for suspended solids and dissolved oxygen, but the author does good work in pointing out the value of other tests. For instance, the chlorides test is shown to be valuable, as it enables the chemist to compare the domestic sewage with the effluent. Owing to the fact that no degree of purification reduces the amount of chlorine, it is possible to tell whether any sample of effluent is the result of the purification of sewage of a given strength. It would, for instance, be very misleading to obtain a sample of effluent the purity of which was largely due to the original sewage being very dilute, and to take it as an example of purification given to the normal flow. Again, the estimation of the ammoniacal nitrogen is useful as being a fair index of any putrefaction taking place in the tanks, it being noted by an increase of ammonia. In such a case where septic action is not required, it points to the tank capacity being too great, or to the need for tank cleansing. Seeing how frequently the tanks at sewage works are made too large, the value of the test is clear. When a filter shows the presence of an appreciable quantity of nitrites, this is a fairly true index that there is insufficient aëration in the filter, due possibly to its being sealed over. Such a result will demonstrate the need for cleaning the surface of a filter. The estimation of nitrates shows to a certain extent the efficiency of the filters. The clarification test is of exceptional value when considering the question of precipitants. With regard to the incubation test, it is noted that a fairly good sample of effluent, void of nitrate, may show signs of putrefaction, while a sample far worse, but containing nitrate, would keep, but, of course, at the expense of the nitrate. The estimation of the caustic alkalinity of a tank effluent is of great value where lime is used as a precipitant, as it prevents the waste of lime, and also prevents a liquid being obtained from the tanks which, being capable of dissolving organic matter, overtaxes the filters. An excess of lime in the tank effluent, moreover, encourages an objectionable grey growth on the top of the filters.

It will be seen that this paper is of a nature to educate the public, as it gives very clear reasons why proper scientific treatment of the matter of sewage disposal must lead to more economical working, proves that the erection of a proper laboratory is not an exceptional matter, and tells the average layman something of the work of the chemist and of its use and value. When members of local authorities have really grasped the value of scientific working it will lead to a great saving of public money and to the appointment of men properly qualified to undertake the important work of sewage disposal.

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Housing in Scotland.

It appears from the annual report of the Local Government Board for Scotland for 1913 that the problem of housing the working classes is as acute in certain districts across the border as it is in England. The board state that repeated instances of house famine and consequent overcrowding, due to the development of the coal industry in central Scotland, have come under their notice. The reason for this is that the introduction or revival of that industry in any part brings in its train large numbers of miners, resulting in the crowding of existing houses to their utmost capacity and the pressing into service of many houses that have become derelict. Private enterprise has apparently failed to meet the need, and the only remaining alternative is that local authorities should provide the required houses. This report may be regarded as the "text" of the excellent paper on "Municipal Housing," which was read at the Ayr meeting of the Institution of Municipal and County Engineers last week by Mr. W. A. Macartney, ASSOC.M.INST.C.E., the burgh engineer and surveyor of Johnstone. The figures which he gave in regard to that town afforded a striking illustration of his theme. The town is a self-contained industrial one, and during the past three years the population is estimated to have increased by 155. During the same period only sixteen houses have been provided by private enterprise, while no fewer than sixty have been demolished or closed, either owing to the issue of closing orders or to their sites being required for building operations. In these circumstances it is easy to understand that, as Mr. Macartney says, local authorities generally are now waiting for a lead on modern lines and on a comprehensive scale.

In leading up to a discussion of the vexed question of economic rents, the author drew a distinction between schemes for rehousing displaced workers and those schemes which may be described as new housing. As an instance of the former, he cited the large operations of the Liver-

peal Corporation, which had up to the end of 1913 spent no less than £1,135,000 on demolition and rehousing, resulting in an annual charge on the rates of about 1½d. in the £. As a new housing scheme, an instance of that which has been undertaken in the Middle Ward of Lanarkshire, where 150 self-contained houses are being erected for occupation by miners, so designed that they may be let at rents which are at once within the reach of the workers and sufficient to make the scheme self-supporting. From these examples the conclusion was drawn that, while schemes of rehousing may cost more than can be recovered from the tenants by way of rent, there is no reason why, with careful consideration of ways and means, new housing should not be on an economic basis. This result, however, can only be achieved by a careful and unbiassed study of economical methods of construction. In England, local authorities are bound by their own by-laws in the execution of a housing scheme, although cases are not unknown in which the law as to this matter has been disregarded. Scottish local authorities, however, are in a position of greater freedom, for by the Burgh Police (Scotland) Act, 1903, the Dean of Guild Court may, upon a report in writing by the medical officer and burgh surveyor that adequate provision is made for light and ventilation, and with the consent of the town council, in any special case, relax or modify to such extent and under such conditions as the Court may think proper, all or any of the provisions of the Burgh Police Acts with regard to the laying out of streets and the erection or alteration of buildings, and the open space adjoining buildings, provided the Court is of opinion that there are exceptional circumstances justifying such relaxation or modification. Upon this Mr. Macartney argues that, inasmuch as the primary object of building by-laws and statutes is to control those who are blinded by greed or ignorance, it is only reasonable that they should not apply to buildings erected by local authorities, who, like the Government, may be regarded as not susceptible to the same temptations as a private individual. The paper concluded with several practical suggestions as to possible improvements and economies in the actual details of construction.

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The Ayr Meeting.

The annual meeting of the Scottish District of the Institution of Municipal and County Engineers, which was held at Ayr on Friday and Saturday last, must be accounted a conspicuous success. The growing importance of this meeting and the remarkable keenness of the Scottish members was evidenced by the excellent attendance and the well sustained discussions on the papers. Of these no fewer than five were read, and two, together with reports of the discussion which followed their presentation, will be found in our columns this week; while the second day—as is usual at Scottish District meetings—was devoted to excursions, including visits to some of the finest scenery in the land of Burns. The meeting was much gratified by an intimation from the president that the council would welcome the nomination of a Scottish member for the position of president of the institution—an honour which is in every way deserved. Of the two papers which we reproduce in our present issue, the first deals with "The Practice of Road Work," and is from the pen of Mr. R. Drummond, the county road surveyor of Renfrewshire. In these days of "modern highway construction" one is apt to forget the important place which water-bound macadam still holds in the practice of road work; and it was certainly refreshing after the flood of literature on methods of tar construction which has been produced in recent years to find that Mr. Drummond's paper was concerned with ordinary macadam roads. The author particularly emphasised the disadvantages of spreading the full width of a road under repair with metal at one time. This practice not only involves much real inconvenience to traffic, but at the same time renders it almost impossible to produce a satisfactory surface, owing to the necessity of allowing the traffic to plough its way through the newly laid metal. Mr. Drummond was not entirely silent as to the use of bituminous binders, and pointed out that if such binders are used great care must be exercised in strengthening the sides, and so forming a proper resistance to the tendency of the metal to creep laterally. The paper, although short, was of great practical interest and was much appreciated.

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Berwick Sanitary Inspector and the Typewriter.

The strenuous way in which some people fight against obvious and necessary changes may be a revelation of character, but it would not be accepted as an exhibition of common sense. At Berwick some of the old-fashioned councillors appear to have made a dead set against that useful if somewhat unmusical contrivance the typewriter, with the result that there has been a prohibition against it, so far as the sanitary inspector is concerned, upon the minutes of the Sanitary Authority since 1912. Recently it was desired to remove the prohibition because of the fact that the inspector's work had increased. It was pointed out that, if the official had to be constantly writing reports for the Government and the sanitary authority, he would be unable to attend to his duties outside, which were much more important than the production of reports. The full-blooded opponents of the typewriter smelt rank heresy, if not something akin to revolution, in the proposal that the machine be provided. One of them suggested that it was part and parcel of a system of "endless expenses for the benefit of officials. Another was profoundly suspicious that "the next thing would be that a clerk would be wanted to work the typewriter," while it was seriously suggested that the sanitary inspector might make use of the surveyor's typewriter—possibly some time after the witching hour when that particular instrument might not be in use. It is a satisfaction to record that the sanitary inspector will obtain a typewriter, in spite of all these protests, though it is only fair to say that when the dye was finally cast, to the manifest chagrin of the opposition, one of their number, in the fulness of his inexperience and obstinacy, declared gloomily that "the typewriter would not be of any use."

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To-morrow's Meeting at Matlock.

The meeting of the East Midland District of the Institution of Municipal and County Engineers which is to be held to-morrow at Matlock, is of special interest, inasmuch as the proceedings will include a visit to the new sewage disposal works for the town which were recently completed. In addition to this, a short paper will probably be read, but owing to some unavoidable delay in settling the final details of the programme it was impossible to get out the circulars as early as usual. Nevertheless, it is to be hoped that with the promise of an interesting meeting many members will avail themselves of the opportunity of visiting this beautiful town, and so help to maintain the well-established reputation of the East Midland District for good attendance. Mr. E. H. Crump, the surveyor to the Hinckley Urban District Council, who is the honorary district secretary, asks that those who intend to be present should intimate the fact to him not later than this (Friday) afternoon, in order that the necessary arrangements may be made.

Institution of Municipal and County Engineers.

SCOTTISH DISTRICT MEETING AT AYR.

The two-days' meeting of the Institution of Municipal and County Engineers which took place on Friday and Saturday last at Ayr will rank as one of the most successful and pleasurable gatherings held by the Scottish District since its amalgamation with the parent body. If not quite so large as had been anticipated, the attendance of members must have been by no means disappointing to those responsible for the arrangements, who are to be warmly congratulated on the general excellence of the programme. Many delegates of county and burgh councils were among those present, and took a prominent share in the business proceedings—which occupied the greater part of Friday, no fewer than five papers coming in for the attention of the meeting. The weather on both days was all that could be desired, and the excursions — particularly the Saturday trip to the picturesque neighbourhood of Loch Doon—were carried through under the best of conditions. Business opened in the county buildings shortly before noon on Friday, the company including Messrs. Thos. Aitken (Fife County), J. Barker (Dumfries), R. Blackwood (Kilmarnock), J. Bryce (Glasgow), W. A. Chapman (Lanark County), W. Clark (Newport), J. Cullen (Stirling County), Thos. Cole (consultant secretary, London), G. Cunnison (Blairgowrie), D. A. Donald (Grangemouth, hon. district secretary), R. Drummond (Renfrew County), J. K. Frazer (Airdrie), A. H. Goudie (Stirling), F. G. Holmes (Glasgow), A. V. Hart (Dumfries County), H. Inglis (Rutherglen), J. Kirkland (Midlothian County), J. Lang (Ayr County), J. Lee (Paisley), J. L. Lumsden (Kirkcaldy), R. Moir (Midlothian County), D. Maxwell (Carnoustie), J. Murray (Port Glasgow), W. A. Macartney (Johnstone), R. Miller (Greenock), C. A. Mackenzie (Monifieth), Murray (Renfrew County), R. McKillop (Perth), M. B. McBeth (Argyll County), R. McDonald (Ayr County), T. Nisbet (Glasgow), J. S. Pickering (Cheltenham, president), F. Pritty (Prestwick), J. Pritty (Selkirk), J. B. Paterson (Dundee), W. H. Purdie (Hamilton), G. Ross (Clydebank), J. W. Dudley Robinson (London, general secretary), D. Ronald (Local Government Board, Edinburgh), A. Stevenson (Ayr County, vice-president), P. C. Smith (Dunfermline), J. Storrar (Midlothian County), J. P. Spencer (North Shields), M. Sellars (Dundalk, hon. secretary, Irish District), C. C. Smith (London), P. Sinclair (Buckhaven), R. Spittal (Lanark County), Jas. Thomson (Dundee), J. Waddell (Burntisland), Wm. Watson (St. Andrews), Jas. Watson (Lanark County), J. Weekes (Irvine), J. Young (Ayr), C. Young (Coatbridge), and W. Ross Young (Lanark County), members; W. Ballantine (Stirling County), W. H. Ellacott (Midlothian), T. Goodwillie (Fife County), A. Goodwillie (Forfar County), J. M. Hunter (Forfar County), J. M. McGregor (Ayr County), J. S. Rankine (Dumfries County), and J. Scott (Perth County), affiliated members; J. Harkness (Ayr County), R. S. Macmillan (Clydebank), T. Gourlay (Fife County), associate members; Judge Chapman (Airdrie), Treasurer McAllister (Airdrie), Councillor W. Kerr (Ayr County), Councillor J. Steel (Ayr County), Councillor Middleton (Ayr County), Councillor Hendry (Ayr County), John Brown (sanitary inspector, Ayr County), John Craig (sanitary inspector, Ayr County), P. A. Thomson (town clerk, Ayr), Councillor Clarke (Ayr County), Councillor Poe (Ayr County), Councillor Turner (Ayr County), Councillor Russell (Ayr County), J. E. Shaw (county clerk, Ayr County), Councillor Dempster (Ayr County), Councillor Sturrock (Ayr County), Councillor Aitken (Ayr County), Councillor Smith (Ayr County), Dr. Macdonald (medical officer of health, Ayr County), John Sturrock (district clerk, Kilmarnock District), Robert Welsh (district clerk, Ayr District), Peter Paterson (district clerk, Maybole District), Mr. Bell (district clerk, Maybole District), Provost Mitchell (Ayr), Bailies Kerr, Murray, Morton and Stewart (Ayr), Dean of Guild Meikle (Ayr), Treasurer Ferguson (Ayr), J. McFadzean (assistant engineer, Ayr), A. G. Dutch (sanitary inspector, Coatbridge), Dr. Hamilton (medical officer of health, Coatbridge), Councillor Smith (Coatbridge), Bailie Agnew (Coatbridge), Dean of Guild Kirk (Coatbridge), Bailie Kenny (Dunfermline), Bailie Spence (Dundee), Councillor Dunn (Greenock), Councillor Robinson (Greenock), Mr. Picken (deputy town clerk, Glasgow), Bailie Brown (Hamilton), Provost Lang (Johnstone), Ex-Provost Armour (Johnstone), Councillor Nicol (Kirkcaldy), W. E. Whyte (district clerk, Lanark County), R. Lindsay (county sanitary inspector, Midlothian County), Councillor Dobbie (Midlothian County), Councillor Millar (Perth County), W. Shaw (town clerk, Prestwick), Provost McClure (Prestwick), Bailie Cochrane (Prestwick), Councillor Menzies (Paisley), and Bailie Lamb (Stirling), delegates.

The President (Mr. J. S. Pickering) said he should like to take the opportunity, before proceeding with the ordinary business of the meeting, of saying with what pleasure he found himself in the delightful country of Scotland. It was a very great privilege to him during his year of office that he should be permitted to preside over a meeting of the important Scottish District of their institution, and he might say that, by the special desire of the council of the institution, both the secretary and consultant secretary were attending the gathering. Mr. Cole, their late secretary, was, he thought, a familiar figure to most of them, and certainly the life's work that Mr. Cole had devoted to the interests of the institution would be known to all. His kindly presence would, he was sure, add grace and dignity to any assembly. In Mr. Robinson they had a worthy successor, and he had already proved an ideal man in the position he occupied, and would, he was convinced, continue to build up the structure which Mr. Cole had commenced. He was sure that the meeting would result both in profit and pleasure to them, and that they would go back to their respective towns with added interest in the institution to which they had the honour to belong.

SCOTLAND AND THE PRESIDENCY.

In reply to a question, the president stated that the council of the institution would be pleased to receive the nomination of a Scottish member for the position of president, and suggested that the district should take the necessary steps in the matter.

The meeting afterwards proceeded to the consideration of the several papers.

PRACTICE OF ROAD WORK.

By R. Drummond,
County Road Surveyor, Renfrewshire.

[Mr. Drummond has had some thirty years' experience as a road surveyor, twenty-five years of this time having been passed in Renfrewshire.]

This is an age of standardisation. Road materials of most descriptions are standardised, their powers to resist strains and stresses are known, and, given certain conditions, a fairly accurate estimate can be made as to their outcome in the service of the road and their respective merits in carrying new and modern traffic. The time, manner and methods of the application of the materials, however, are yet a speculative quantity, and the writer suggests that

this phase of the question is worthy of a place in the programme at the proceedings of an annual meeting.

In discussing practices of road work, it must at once be admitted that the practice for urban roads might not, and in a great many cases could not apply to rural roads, and the writer desires it to be understood that these remarks exclude wood, causeway, concrete, or any of the more expensive road formations, and are confined to "macadam" work. On this footing, roads, rural and urban, can be dealt with from the same standpoint, and he proposes to deal with the question of the method of practice of laying what is known as "water-bound macadam," and which might preferably be called "ordinary macadam."

In laying ordinary macadam, the practice of using water with mud or some soft earthy matter for binding or blinding purposes is still prevalent in many districts, and one of the reasons sometimes given for doing so is that the expense of procuring or using better binding materials cannot be afforded. Experience has shown that macadam laid on the mud and water principle is, in the end, the most expensive, and for carrying mechanically propelled traffic gives the poorest results.

For roads carrying a light or medium traffic an improved system of laying macadam is to bind the metal with whin or granite chippings, and, if laid in winter, the moisture in the road will keep the surface quite good until the dry weather permits of tar-spraying in the spring. If the metal is laid during summer, the binding should be tar-sprayed as the work proceeds. For roads with heavier traffic the same process of metalling should be carried out, if possible during the summer months only, and the surface consolidated with a more liberal application of tar or bituminous mixture. These methods give excellent results, and if the chippings are accounted as metal, the saving in the work of procuring and applying mud and water, to a considerable extent, meets the cost of the bituminous binder; besides, the extended life of the road surface, resulting from the use of a bituminous binding, effects a material saving.

The practice of covering the road with metal full width at one time is not to be commended. It is impossible to produce a satisfactory surface if the passing traffic is allowed to plough its way through newly laid metal, and it not infrequently happens that no watchman or signal is left to warn road users of the condition of the road surface. In such cases no wonder there is a general howl by all those who have to pass that way, and have no option to go round by another road, as is frequently possible in urban areas. On very secondary or third rate roads full width coatings may be laid without inconvenience, but where the road is of any importance—the plea of not wide enough not excepted—the method of coating half width at a time is much preferable; by no other means can the metal coating be well and truly laid, and a properly finished surface obtained.

Another important factor in the practice of road work is the proper and discriminate use of the steam road roller. Too much rolling previous to the metal being properly packed sets up an irregular, wavy surface, and particularly so where mud and water are used as the binder. Rolling and metalling in half widths permit of proper care being exercised in workmanship, and keeping traffic from passing over the metal until in a proper condition to receive it. This practice involves a watchman and the rolling plant left on the road to guide the traffic out with working hours and over night, also to guard the new coating previous to its becoming set or consolidated. It also is economical in respect that no time is lost removing the roller at night or fetching it in the morning. As a set-off to the expense of providing a watchman, a full day's work on the road is obtained, and the public are warned and guarded against unrolled metal, which gives rise to frequent complaints.

An old-fashioned practice of keeping a round contour and open water channels along the sides of the carriageway is no longer feasible. If a bituminous binder is used great care must be exercised in strengthening the sides and forming a side resistance to keep the metal from creeping laterally, or, failing provision in this direction, the benefits accruing from a bituminous-bound surface are quickly lost. Even an open side ditch near the fence may be a source of weakness, and great advantage may be derived by piping and filling up the open ditch; thus the surface water is quickly disposed of and the roadside weighted to help in keeping the carriageway from spreading. On roads carrying heavy traffic resort may be had to more drastic means, by laying a line of heavy submerged stones or kerb to stop the spreading process. In the town or urban area this is unnecessary, as the side walk, with its kerb and channel, fulfils that purpose.

Of no less importance in the practice of road work is the grading and spreading of the metal. In the author's experience, each grade or size should be separately applied, instead of first mixing the various grades into one mass before application. Good spreading is of first importance, and it is very difficult, if not impossible, to make good work from a mixture. With the specification recommended by the Engineering Standards Committee proper grading is easily accomplished, and if properly spread the risk of inequalities and waviness of surface are largely eliminated.

In dealing with the results to be obtained there is always the human element to consider. Men of aptitude and skill must be obtained and trained to the work, they must be directly employed and encouraged to remain in the service. The time when any kind of man was thought to be fitted for road work is gone, and without a full and efficient staff road work can never be properly executed.

It is not proposed to refer to practices in connection with roads carrying extremely heavy traffic; such roads require special treatment, special materials, and special machinery. The aim of these notes is rather to bring under review the work and practice as carried out on the average roads throughout the country, and where ordinary metal coatings, if properly laid and properly bound with some sort of binder other than mud and water, would be capable of carrying satisfactorily a large volume of traffic and meet all requirements at the present time. To some extent these notes are a reiteration of what the writer put forward and urged a few years ago, and he now desires to emphasise that experience and time have now proved beyond a doubt that the newer methods or practices are essential for modern requirements, and that they are a real economy.

DISCUSSION OF MR. DRUMMOND'S PAPER.

MR. W. A. CHAPMAN (Lanark County), opening the discussion, said he thought the day had passed when surveyors used mud for the resurfacing of roads. In his own county the costs were going back, and, as a matter of fact, that was due to the improved binders employed and the extensive use of tar-macadam and surface-tarring. His last year's expenditure was reduced some £645, and this year would be further reduced. Mr. Drummond had referred to the practice of dealing with the whole width of the road at a time, but in that connection he did not agree that the services of a watchman were required to warn road users of the condition of the surface.

Mr. R. SPITTAL (Lanark County) said he did not agree with the author that on important roads the method of coating half width at a time was much preferable. He did not think that was so either with ordinary or tar macadam. In his experience, try as they would, they could not obtain a proper join. With regard to the question of ordinary water-bound macadam as against tar-macadam, it was realised by every road surevyor that if they could only get the necessary money tar-macadam was what should be put down. They were governed by the amount of money placed at their disposal.

Mr. W. BALLANTINE (Stirling County) said the observations which Mr. Drummond had made in his paper were serious truisms which all road surveyors there would entirely agree with, and therefore there was little ground for criticisms from them. If they carried out the suggestions put forward he had no doubt they would succeed in the work before them. There had been a great step in advance in the work of road maintenance in the past ten years, and they had got on to fairly satisfactory lines in regard to the main roads. He agreed with Mr. Chapman as to the necessity of using some binder on all their main roads; that was being done generally throughout the country, and more especially since the institution of the Road Board, with its grants for the improvement of roads crusts. Tar-macadam in one form or another had been adopted for all the through roads in the county of Stirling. Those that had been down for three or four years now only required resealing and keeping up with a little spray and patching year by year, and the cost of those roads would be gradually reduced. That was the aim and object they had in view. For country roads in rural places,

where the traffic was ordinary and the assessable area small, he held there was nothing better than the ordinary macadamised road, and they must continue that system until they could overtake them with the more modern methods. Mr. Drummond did not commend the practice of covering the road with metal full width at one time; but with a 30-ft. road it was quite possible to do one half at a time, and so preserve the material from being destroyed by the traffic as soon as it was laid; but on an 18-ft. road it was simply impossible to do that satisfactorily. In such a case one did not get a uniform pressure over the half of the road as on the whole, and accordingly he thought it was better to do the whole width at one time. While referring to that point, he might put in a plea to their motorist friends to put up with a little inconvenience while repairs of that kind were going on.

Councillor Dobbie (Midlothian County) put forward a suggestion for the conferring on surveyors of power to close to traffic without notice roads which it was intended to repair. If that could be done the result would be the avoidance of a tremendous amount of damage that was at present done to new roads by people who insisted upon going on to them before they were in a proper condition to withstand the passage of vehicles.

Mr. R. Moir (Midlothian County) spoke of the damage done by heavy motor 'buses going on to newly made tarred roads, and suggested that the county council ought to have more power in regard to the closing of these roads against such traffic while such operations were proceeding.

Mr. M. Sellars (Dundalk) agreed that, where a road was less than 18 ft. in width, it might be coated with one operation, although he admitted it was a hardship to motorists.

Mr. R. McDonald (Ayr County) put an inquiry as to whether Mr. Drummond made use of machine or hand broken chippings. In water-bound construction the machine did not bind so well as the hand broken material.

The President (Mr. J. S. Pickering), in closing the discussion, asked Mr. Drummond to accept the thanks of the meeting for his very interesting paper. Mr. Drummond had made an interesting remark in regard to making roads in half widths. He did not think that engineers were generally in agreement with the author in that respect, and if it went forth that they were, he was afraid they would have a bad time with the motorists. It was certainly inconvenient to have the whole stretch of road under repair at the same time, but his own experience was that one got a better job by doing the whole width at once instead of in halves. He was rather surprised the author's experience was different, and that he could make a road satisfactorily in the manner suggested. The matter of the closing of the roads was important. In boroughs, of course, they could do that as they chose, but not on main roads, where there was no thoroughfare on to which the traffic could be diverted. As to watchmen to protect the road, where there was the slightest danger he considered their employment most desirable.

Mr. Drummond, in replying, said he desired at once to make himself clear in regard to the point as to the method of repairing roads. They must not think for a moment that he regarded the half width method as the best thing. The better way was, of course, to coat the whole road at once. But the fact remained that in the country they had no power to shut their roads when they declared them dangerous, and as he went through the country he came across numerous places where roads were being done full width when the half width method would have ensured a good job. He held the opinion strongly that if they were doing a road they could not shut, and did it otherwise than by half width, they did it wrongly, and he insisted there was no difficulty in doing it half width if they went about it rightly. It was not unusual to find, with the other method, material all over the road, and the traffic plunging through the metal. It was that practice he condemned, and he had no other object in advocating the half width than to get the best results. As regarded the mud-and-water principle as against any other principle, his experience over a considerable number of years had shown him that it was a most expensive method. When people complained that they had no money to enable them to do otherwise, his reply was, "Why do you continue the most expensive system when you have the least money to do it?" Mr. Ballantine had said that it was impossible to bind with [illegible]. He disagreed; it was quite easily done. His view was that the over-rolling that went on accounted for the waviness that occurred. But the 18-ft. road was as easily divided into two and the work easy of accomplishment if they went the right way to work—which was to protect their metal while it was on. As to binding with chippings, he used both machine and hand broken, and found no difference between the two.

MUNICIPAL HOUSING: A PLEA FOR ACTION, AND AN INQUIRY INTO POSSIBLE ECONOMIES IN SCOTCH HOUSE CONSTRUCTION.

By Wm. A. Macartney, Assoc.M.Inst.C.E., Burgh Engineer and Surveyor, Johnstone.

[Mr. Wm. A. Macartney was educated at Dunoon Higher Grade School and the Royal Technical College, Glasgow. He was trained in the office of the burgh and water engineer, Dunoon, first under Mr. Chas. Mackintosh, F.S.I., M.C.E.I.A., and later under Mr. Jas. Andrew. For some time he acted as chief assistant to Mr Andrew, when among other important works the East Bay esplanade and harbour were constructed at a cost of £40,000. In 1906 he received the appointment of assistant to Mr. John Bryce, M.Inst.C.E., burgh engineer, Partick, and three years later became his chief assistant and deputy. In October, 1912, he was appointed, from a large number of applicants, and without the usual formal interview, burgh surveyor and sanitary inspector of Johnstone. Mr. Macartney is an associate member of the Institution of Civil Engineers, a member of the Incorporated Sanitary Association of Scotland (by examination), and a member of the Institution of Municipal and County Engineers. He is secretary of the Housing and Town Planning Committee of the Scottish district of the institution. Last year Mr. Macartney was appointed lecturer on municipal engineering and town planning in the Royal Technical College, Glasgow, this being the first class of its kind in any college or university in Scotland.]

When international and industrial conditions are restored to their normal again, one of the most pressing problems which local authorities will require to face will be that of housing. During recent years the Legislature has attempted in many ways to stimulate action in the matter, with only a very moderate amount of success. The disease has certainly been diagnosed, but such efforts as have been put forth to combat it have not done much more than expose its magnitude and its evil influences.

The facts are well known to all. They have been commented on in numberless annual reports for some years back. In brief, they amount to this: the increase in the number of houses built is not keeping pace with the growth of the population and the developments of industry in many districts.

A few figures applying to a self-contained industrial town will possibly illustrate the state of things just as effectively as a return for the whole country. In the three years the writer has been in the burgh of Johnstone, the total valuation of the buildings passed by the Dean of Guild Court has been nearly £50,000. Of that sum, £7,000 represents the value of dwelling-houses, and the remainder is made up of extensions to public works, schools, and halls, and alterations to business premises. This £7,000 provided a total of sixteen houses, while during the same three years no less than sixty houses were demolished or closed, either owing to the issue of closing orders or to build-[illegible]

the population is estimated to have increased from 12,000 to 12,200. Hence, although there have been [illegible] additions to public works, and a perceptible increase in the population, the actual number of available houses is forty-four less than three years ago.

Figures much more impressive than these could doubtless be submitted by many members of the institution, and had the report of the Royal Commission on Housing been forthcoming, nothing further would require to be said. In its absence it may be permissible to insert two other extracts which show in a little detail two different aspects of the subject.

In a semi-official* report reference is made to two outstanding features in existing housing conditions—viz., (1) the existence of many overcrowded slum areas, and (2) a marked scarcity of houses—and it is remarked, "The large slum areas are, of course, most prevalent in the largest towns, where the very worst effects are found. The absolute scarcity of houses, on the other hand, is more directly an urgent problem in the middle-sized and smaller towns; but even in these this scarcity contributes greatly to overcrowding in such houses as there are in these towns and villages. . . . In Cromarty and Lerwick, for example, as well as in larger towns like Greenock, Dunfermline, Wishaw, &c., there is this economic demand for housing accommodation for people who can pay the necessary rent, and the absence of the necessary houses has the effect not only of increasing the overcrowding in the houses that are available, but also of increasing the rents of these houses."

In an official† report the following is stated: "Repeated instances of house famine and consequent overcrowding, due to the development of the coal industry in central Scotland, have come under our notice. The introduction or revival of the coal industry in any part brings in its train large numbers of miners, who have to be housed. The result is that existing houses are crowded to their utmost capacity, and houses that have become derelict are pressed into service wherever possible. . . . The colliery company maintain that they have no duty to provide these houses, that they have more profitable uses for their capital, and that little return can be secured on any outlay. . . . Private enterprise shows little signs of meeting the situation, owing to the increase in costs and the small rent paid by the miner. There remains the alternative of the local authority providing the necessary houses."

It is, then, an indisputable fact that private enterprise, so long depended upon, has within recent years failed. To inquire into the reason for this would be to stray beyond the bounds set for this paper, and would but obscure the ultimate aim in view.

The town of Greenock was the first burgh in Scotland to adopt Sir Richard Cross's Artisans' Dwellings (Scotland) Act, 1875, by proceeding with an improvement and rehousing scheme in 1877. Other towns, even in the days when private enterprise was in her lusty prime, have followed with schemes of varying success. These were often expensive, so that, while furnishing many lessons and much experience, the chief thing many authorities learned was that in housing matters it was advisable to

"Think weel ere fear ye rue it"

—a not invaluable lesson too.

Authorities generally are now waiting a lead on modern lines and on a comprehensive scale, and surely that will not be much longer delayed.

On examining the arguments for municipal housing, other than that of real urgency, we find, as has been mentioned before, municipalities are being asked to take up housing because private enterprise has failed to keep pace with local demands. What will be said if it is suggested that local authorities should take up a more advanced position, and drop this apology for its housing schemes, whether they be rehousing or new housing? It is said that private enterprise is better able to build houses than a public authority, and, in fact, this idea has been dinned into one's head for so long that it is accepted without hesitation or qualification. Of course, it may be true to a greater or lesser extent, but in that case, or, as old Euclid would say, "similarly," private enterprise must also be better able to build waterworks, gasworks, tramways, wash-houses, and a score of other recognised factors in modern communal life. In this climate a substantial and healthy shelter of some kind is one of the necessaries of life, and it is putting the cart before the horse to provide water, gas, sewers and roads, and put the onus on others to provide the house.

Of course, this is a very heterodox view to put forth, but many old ideas are at this time going by the board, and perhaps this argument will take a little looking into. It is not suggested that private enterprise should be harassed or hindered in the slightest—rather let it be encouraged—only it is suggested that local authorities and their officials should adjust themselves not only to the need, but the trend of the times.

There is this further thing to be said: In the past property has been looked on as a sort of gilt-edged security. A man with a little money was pleased to invest it in a building scheme because he could see where his money was placed; now, for various reasons, property is not so favoured by money-lenders, and the rate of interest on bonds and mortgages is high. Local authorities can borrow money more cheaply than a private individual, because of the better security they can offer, and for a housing scheme the Government offer authorities money on very reasonable terms, both as regards rate of interest and period of repayment of loan. Even if a local authority decides to proceed with a housing scheme, it must still employ masons, carpenters, plasterers, &c., to erect and finish the houses, so that, after all, its work is confined to designing, supervising, and capitalising, and the builder has not been so very successful in recent years that he need object very strongly to being relieved of these functions.

At this stage it may be advisable to point out that what is called municipal housing really consists of two separate and distinct sections—viz., rehousing and new housing. Each of these raises difficulties, but the former, from the nature of the case, is always of an expensive nature, and never wholly satisfactory.

It is easy in certain cases to shut up houses which have become uninhabitable, but unless provision is made for the people dispossessed, they will possibly move into other dwellings in the same district, perhaps already inhabited, and cause more overcrowding and worse conditions than those they have left.

Again, there are properties and areas which, though in a bad way, cannot be closed, though the conditions are such that they are a source of danger to the health of the district.

In both cases the duty of the local authority often resolves itself into the purchase and demolition of the old properties, and the rehousing of the old population in new and improved dwellings on the same site.

The city of Liverpool furnishes good and concrete examples of rehousing the poorest classes. According to a report,* up to the end of 1913 Liverpool had spent £1,135,000 on demolition and rehousing, the nett charge to the ratepayers on the whole outlay since 1864 being £37,000 per annum. The cost of the special policy of housing the people alone is £22,700 per annum, a matter of 1½d. per pound on the rates. Liverpool, however, does not grudge this sum, as she considers the money well spent, affecting as it does the health and moral welfare of all the citizens. She has now 2,174 new dwellings under her charge, and a population of 8,103, every one of whom has been turned out of an insanitary house, a cellar, or an overcrowded room.

In the carrying out of such work one's hands are tied in many ways—for example, in the number of houses to be erected, and the height and style of the houses. Such work, in fact, depends so much on local circumstances that many of the ideas mentioned in the latter half of this paper would possibly not apply. These refer more to the erection of new houses to relieve the congestion and scarcity already existing in many towns and districts. A good example of this new housing is to be seen in the Middle Ward of Lanarkshire, where 150 houses of the self-contained type are being erected for miners by the District Committee. Each house, of the dominant type, is equipped with bath-room, scullery, pantry, coal store, and living-room downstairs, and two or three bedrooms upstairs. The houses are to be let at rents within the reach of the workers, which rents, at the same time, will be sufficient to make the scheme self-supporting.

This raises the question of uneconomic or economic rents, the schemes just referred to furnishing us with an example of each. The opinion of the writer is

* "Scottish Land." Hodder & Stoughton, 1914.
† Annual Report of Local Government Board for Scotland. 1913.

* "Rehousing the Dispossessed in Liverpool," by Colonel G. Kyffin-Taylor, V.D., M.P. 1914.

that, while schemes of rehousing may cost more than can be recovered from the tenants by way of rent, there is no reason why, with careful consideration of ways and means, new housing should not be on an economic basis, and this without increasing the rent, so that, as sometimes happens, the class that the dwellings are intended for are unable to pay for them.

Such a result requires that local authorities, and particularly their surveyors, be prepared to study the subject of building construction with minds free from the bias which tradition and custom engender. They must also remember that the letter of the Burgh Police Acts is not really inspired or infallible, nor are the various by-laws, good as they are, the last thing which may be said on the subject. We have for some time been accustomed to complaints from architects and builders as to our general building regulations. These complaints have usually been lacking in definiteness, and the complainers have not been able to show us how we could do our business without statutes and by-laws. We, on the other hand, have flattered ourselves that, by sitting tight and refusing concessions of any kind, we have been just and fair to all alike. The author would suggest that this policy of sitting tight can be carried too far. He is aware of the great difficulties that await the authority which is hardy enough to use discrimination, but, despite that, there are times when this must be done, and one of these times is now.

Such a practice is in harmony with the Burgh Police (Scotland) Act, 1903,* and sec. 39 is quite clear and emphatic on this point. It states: "The Dean of Guild Court may, upon a report in writing by the medical officer and burgh surveyor that adequate provision is made for light and ventilation, and with the consent of the town council, in any special case, relax or modify, to such extent and under such conditions as the court may think proper, all or any of the provisions of the Burgh Police Acts with regard to the laying out of streets and the erection or alteration of buildings, and the open space adjoining buildings, provided the court is of opinion that there are exceptional circumstances justifying such relaxation or modification."

Another reason for modification of by-laws suggests itself. While burghs act under the Burgh Police Acts, the county districts, even though perhaps more truly urban than many burghs, are not so placed, and they may allow buildings to be constructed which do not comply with these Acts in various important particulars. Where there are county by-laws in operation, these are generally less stringent on the constructional side than those, possibly, in adjacent burghs. One illustration will show what may sometimes happen. Plans were sent to a burgh surveyor for a timber and iron house of the bungalow type to be erected on the outskirts of the town. The plan was defective in several respects, and particularly in regard to ceiling heights. These defects were pointed out and the plan was withdrawn. Shortly afterwards the house was erected outside the municipal area, according to the original plan, the county officials making no objections. The position is certainly anomalous, and as it will be impossible to bring counties into line with burghs, it may be suggested that the burghs might obtain a little of the freedom which the county districts enjoy without allowing that freedom to degenerate into licence.

The final agreement, as it seems to the writer, is this: By-laws and statutes are meant to keep in check those blinded by greed or by ignorance. The Government is free from the ordinary building restrictions, and we do not object to this, because, for one reason, the State is supposed not to be susceptible to the same temptations as a private individual.

In the same way, then, it is now suggested that a local authority should take advantage of the powers given and amend her systems of construction so that she may supply the worker with a good house at a moderate rent. Of course, under a town planning scheme, power to amend by-laws may be given, but this more cumbrous process is not necessary in a simple housing scheme.

Coming now to the actual details of Scottish housing, it may be premised that in the past municipal housing has consisted chiefly in the erection of tenement houses. It is the fashion nowadays to decry this type, and to say that working men want cottages. The statement does not appear to be generally true, as the author could give instances of intelligent working people leaving self-contained houses to reside in new tenements. It may be true that certain sections may talk of cottages, but these sections are small, and the mass of the people need to be educated up to the cottage type of house. In rehousing schemes the cost of land and other considerations will possibly demand houses of two or even three stories. As practical men let us not condemn the system unless we can show a better one for such situations. The tenement is not wholly evil; in fact, when well planned and constructed it has a number of advantages over all other types of construction, and as long as people desire it, and the conditions demand it, so long will it remain with us. We can, however, remove its worst fault—viz., its height. Four or five story blocks should not be allowed, and even three stories should only be considered in wide streets.*

Cottage or semi-detached houses are often reserved for the outskirts of the town, or where land is cheap. The transit question consequently affects them, and tends to hinder their popularity. In fact, the solution of the transit question would go a long way to solve some phases of the housing question. A well-managed tram service is a great boon, and its lines should be laid down in advance of the building scheme if possible. Further, a rearrangement of working hours in factories and workshops is a desiderata, and the following suggestion has much to be said for it†: "The meal hours at present in most of the works are only three-quarters of an hour. For a man to walk fully a mile and back, and take a meal in that time would, in my opinion, do him more harm than good. Then there is the alternative of carried food, chiefly tea—another objectionable proceeding. My idea, which I fear will not be popular, especially among the younger men, would be to start later in the morning, take breakfast before starting, have one interval of, say, one and a-half hours for dinner, and work a little later at night and on Saturdays. If such a system were universal, men would not be so averse to living a little distance from their work."

Building construction in Scotland is, generally speaking, substantial, and we are in the happy or unhappy position of having no official "model" by-laws to bind us, though many towns have their own by-laws. Perhaps we build too substantially, and find that the shell of our houses is sound, while the design and details of construction and finish are quite out of date. An ordinary dwelling-house which survives for the Psalmist's "three-score years and ten" surely does well enough.

The suggestions for more economical construction of municipal houses which follow are based on the arguments which have been already adduced—(1) that it is necessary to proceed with municipal housing schemes in many districts to-day; (2) that to do so successfully some modifications of existing building practice and regulations are called for; (3) that, even though these modifications render the building less substantial than has been the case heretofore, so long as the life of the building exceeds the period allowed for repayment of loan, that should be considered sufficient.

Most of the economies to be mentioned have been dealt with before, but their applicability to Scottish conditions has not, so far as the writer is aware, been brought before our members, and they will, it is to be hoped, evoke a good discussion now.

Taking them in the order in which they generally come, and not in that of importance, we have:—

FINANCE.

It needs no demonstration to see that the more cheaply money can be obtained, the better success the scheme will be. Unless in exceptional circumstances, however, the best terms will be obtained from the Public Works Loans Commissioners, and their general conditions, that the cost of buildings must be repaid in sixty years and the cost of land in eighty years, cannot be taken exception to.

SITE.

The choice of a site is a very important matter indeed. Where a rehousing scheme is contemplated, the site is already fixed and must be made the best of; but for new houses a selection is generally possible. In the latter case busy, important streets should be avoided, and sites fronting possible costly new streets should also be looked on with disfavour. Quietly situated ground, not too far from the centre, where underbuilding will be reduced to a minimum, and with gravel or loam, or other suitable soil, where concrete or asphalt under the ground floor is unnecessary,

* See sections 39, 40, 61 (6).

* See diagrams appended to paper on "Town Planning," by John Bryce, M.INST.C.E., submitted to this meeting.

† From Annual Report for 1914, by M. H. Taylor, M.D., M.O.H., Johnstone.

would be the ideal site. In many places such land should be obtained at a moderate ten dality. It is not necessary to have the houses fronting to a wide road, and various types of crescents and hollow squares, favoured in many garden suburbs, to keep down road and sewer charges, may be adopted with advantage. Savings may also be effected by making the buildings suit the site, and placing, as much as possible, the longest dimensions of the houses parallel to the contour lines. The number of houses which may be placed on a nett acre is a very important point, and not to be disposed of on ideal or theoretical considerations alone. In a large burgh of over 70,000 inhabitants, the writer found, a few years ago, that the new houses being erected varied from eight per acre on the villa area to seventy-five per acre in the heart of the town. The latter were of the two-roomed kitchen type, and were in accordance with the Police Acts. The first excuse for this great number of small houses was the cost of land, and the second was the desire of the builders to get as much out of their ground as their neighbours. This second reason need not weigh with a municipal housing scheme, but we must get cheap land at £100 per acre or less, and not exceed one-fourth of that sum if we wish to provide a moderate number of houses to the acre.

DESIGN.

The favourite house of the working classes is, undoubtedly, the room and kitchen, and the two-room and kitchen flat, and, while the number of apartments is small, it must be added that the cubic contents of these houses will compare favourably with those of double their size (as regards apartments) south of the border. While it cannot but be admitted that for health and other reasons it would be better to have the great cubic space split up into more compartments, yet we cannot get away from the fact that the Scotch "kitchen" is a great favourite which will not be easily displaced by the alternative "living-room." If the room and kitchen design is retained, it will only be economical if built in blocks, a convenient size being four houses on the ground floor and four above, the latter approached by a back stair and balcony. Each house should have its own scullery, with boiler and tubs, bath-room with water-closet and bath, pantry, presses, &c.; but useless corners and long, narrow lobbies or passages should be avoided. Valuable space can be lost in defective planning, so that the cost per cubic foot is not always a guide in determining whether a design is efficient and economical or otherwise.

Where the English type of house is adopted, the standard design, with living-room, pantry, scullery and bath-room downstairs, and two or three bedrooms upstairs, will doubtless be adopted. A slavish adherence to a standard type should not be attempted, but consideration given to local usages and requirements. One barbarous custom in such houses is to put the water-closet outside, entering off a yard; the reason for this in new houses the writer has never been able to discover. This type may be built in semi-detached fashion or in rows. The latter will work out cheaper in a big scheme, but the rows are unsatisfactory unless there is a private service lane behind, and in any case six or eight houses in one block will be sufficient. The cost of the service lane, again, would run away with the saving effected by building in rows.

MATERIALS.

While one need not attempt to keep back the wheels of progress, yet it is advisable to employ new materials only after they have been most carefully tested and proved. Nor should construction be cheapened by using materials simply because they are cheap. It is a good rule to employ the materials found or generally employed in the district, as, strange to say, these often seem to suit local conditions better than, or at least as well as, more expensively obtained stuff. Thus, for example, for walls, either brick, rubble or concrete may be used, depending on the local circumstances; but a mixture of these would be unsatisfactory. Again, as regards roofs, "the introduction of bright red, highly pressed tiles in districts where such a roofing is not generally found is as undesirable as the needless introduction of a blue slate roof into a district where tiles have invariably been employed."* Generally, then, and without particularising further, it may be said that the materials selected should have proved their worth, be suitable for the district, and reasonable in cost. Going on these lines, simple, pleasing elevations will be obtained, satisfactorily serving their purpose. In the report* above, it is pointed out what we may have already discovered—that average tradesmen are slow to take up new materials and systems of construction, and these are often quoted for at higher rates than are really necessary because of their novelty. "Experience has shown that the importation of a standardised plan novel to the district may result in an increase in cost."

CONSTRUCTION.

Mason Work.—Generally, concrete foundations for walls have been proved satisfactory and economical, while for dampproof courses, in the absence of local materials, rolls of asphaltic material are exceedingly handy and serviceable. In the ordinary rubble wall there always appears to the writer to be too much thickness for the strength required, especially in low walls. This is a case which is not subject to by-laws to any extent, but is a matter of use and wont. One often finds rubble walls built with a dressed outside face and an inside face, while the heart of the wall is filled up with mortar and shivers of all sizes. This does not make for strength unless sufficient headers are employed. In houses of two stories only it is suggested that thinner and more compact rubble should suffice, though, if the writer had to choose, he would prefer a brick hollow wall, with two 4½-in. brcks and a 2½-in. to 3-in. chase between. This wall, rough-casted on the face, seems ample for two stories, and the saving it would effect in strapping and lathing would, even in districts where bricks are scarce, possibly more than counterbalance the extra first cost of the materials.

One of the requirements of the Police Act which should be dropped is that referring to skews. These are most unsightly—in semi-detached houses particularly—are expensive to construct, and more expensive to maintain. Unless a property is not over two full stories such a requirement should not be insisted on. It should be quite sufficient to carry the party wall to the underside of the roof sarking. This party wall will possibly be the only brick wall in the house, the partitions being of standard and lath, and if built in cement mortar will do 4½ in. thick, except at chimneys and presses, of course.

Carpenter and Joiner Work.—Here, again, use and wont play a considerable part, and we find heavy timbers used in floors, and particularly in roofs, which seem to be a waste of money. This may be due to wide tenements demanding deep joists, and the habit has spread to buildings of all types, and many architects and builders get into the way of using certain sizes of joists and spars with little regard to the actual spans. Of course, it is difficult in roofs to say where the line should be drawn, as stress diagrams for ordinary roofs are not easily got, and we all prefer to err on the safe side; yet, if a 6-in. by 2-in. spar will do instead of a 6½-in. by 2½-in. spar, the saving will be found to be quite appreciable. A colleague has informed the writer that in a building which he designed, 120 odd feet long, in order to reduce the cost, 6½-in. by 2½-in. roof spars were replaced by 6-in. by 2-in., and the intervals between same rearranged. The result of this was just as satisfactory a roof, and a saving of £100. In roof construction generally it will be found that the less the roof is cut up for windows or other openings, the cheaper will the job be.

Flooring for a long time has been laid on joists at 18-in. centres 1½ in. thick, but in a number of places—for example, a large building scheme of four-story tenements in Glasgow—⅞-in. flooring is being used. The explanation given is that this is sufficient for strength, and as all floors are now covered with linoleum or other floor covering the wear will be slight. In many English cottage schemes deafening is omitted from the first floor, and as each house is in the possession of one family there is something to be said for such construction, though the writer would prefer to have the deafening.

Of course, plain skirtings and facings, instead of moulded timbers, are quite feasible, but framed and lined internal doors have a very cheap look about them, especially in the larger apartments, and a plain panelled door would not cost much more.

Other Works. The ornamental plaster work, coved cornices, centre flowers, &c., should, of course, be omitted, and only a simple round formed at the junction of the wall to the ceiling. This is not only an economy, but is also an advantage from a hygienic point of view, and is really quite pleasing to the eye.

* Advisory Committee on Rural Houses. Report.

* Advisory Committee on Rural Houses. Report

Wall-paper, again, will give place to the healthier distemper, and timber work will be stained.

In connection with drains, a careful planner will take pains to avoid armies of disconnecting traps, whose perforated gratings are generally strong temptations to children to drop articles through and choke the traps. Where the property is a row and belongs to the municipality, individual connections from each house to the sewer are not required, and the saving in intercepting traps and inspection chambers is bound to be considerable, while the maintenance charges will also be reduced.

Cellars and wash-houses in the courtyard had better be avoided. They are often badly kept, and are apt to become unsightly. Parapet walls and railings round feus can quite well give place to light fences and hedges. The latter are perhaps not too satisfactory at first, but they will soon improve, and in the meantime a light form of fence might be erected to serve till the hedge grows up.

Ceiling Heights.—The Burgh Police Act fixes the minimum ceiling heights at 9 ft. 6 in. on ground floor, and 9 ft. on other floors, except attics, where 8 ft. is allowed. These sizes apply to all houses, whether of one or five stories, in all streets, whether wide or narrow, and in all areas, whether open or congested. The mistake of this cast-iron requirement has been often demonstrated and discussed. While the writer does not say that these heights are excessive in the case of crowded town tenements, he is certainly of opinion that to insist on them in all circumstances is unfair and foolish. High ceilings are often pockets for stagnant air, and an increase in floor space instead of wall height would be a great advance. The time seems to have come when some difference should be made on ceiling heights in houses of one or two stories, at any rate, and 1 ft. could be taken off each story without doing much harm. When the building goes beyond two stories, the ceiling heights would require to depend on the width of the road; this, however, is beyond the scope of the present paper. This is one of the points which will doubtless provoke discussion, but intending critics might say why ceilings in England are from 1 ft. to 1 ft. 6 in. lower than in Scotland. The Scottish Local Government Board* recommend the lower heights, and the Dunfermline Burgh has, it is understood, decided to allow ceilings of 8 ft. 6 in. and 8 ft. respectively in new cottages in the town planning area.

Widths of Streets.—Where the building scheme is of any extent it will be possible to avoid considerable expense if streets are constructed to suit the traffic they are likely to carry. This is a point which is continually cropping up in town planning schemes, and though the writer is against narrow lanes being called "roads," yet it is suggested that the 40-ft. street of the Police Acts is too wide for many districts. If the road is a through road, or ever likely to become one, then 40 ft. between the parapets is not too much; but if otherwise, 30 ft. between the parapets, or even less, will do.

Organisation, Standardisation, &c.—These are matters whose presence or absence will affect the ultimate cost to a varying extent. Their value is self-evident, and particularly so in a large scheme. A small scheme, as a matter of fact, will not give an outlet for these, nor provide a satisfactory test of the theories and opinions advanced in this paper.

It is, of course, difficult, if not impossible, to put a value upon the economies suggested. Varying results will be obtained in different places, and it is not possible to realise an ideal in any one scheme. There is this other consideration, too, that one must deal with *ante bellum* prices. The author ventures the opinion that the savings which may be effected will be considerable. In a report issued 1913,† the following figures, prepared by a Glasgow firm of measurers, are given in regard to two sets of plans prepared by a Lanarkshire architect:—

BLOCK OF FOUR ONE-STORY HOUSES.

Plan No. 1.—Cost, according to plans, including street making, £740; cost, according to burghal by-laws, and including street making, £835.

Plan No. 2.—Cost, according to plans, including street making, £820; cost, according to burghal by-laws, and including street making, £928.

The relative figures seem quite reasonable, and tend to show the differences in county and burghal regulations, and the effect of same on costs, even in houses of the same class of construction.

* Memorandum. November, 1912.
† "Lanarkshire Miners and the Housing Question."

The writer has gone into the question as he has seen it in his own district, and the following figures which he submits, while approximate only, may be accepted as correct. They refer to a block of twelve houses in a four-story tenement, and a scheme of semi-detached cottages, both built about the same time and within 3 miles of each other. Both schemes are, of course, built by private enterprise. The tenement is substantially built, with dressed stone front, tiled close, good fittings, and very high ceilings (over 10 ft.). The cottages are, to a certain extent, in harmony with the suggestions of this paper. In each case the cost of the buildings themselves is given, and the cost of street making, sewering and other similar charges is not included.

TENEMENT.

No. of houses, twelve.

Size of houses—eight, one room and kitchen; cubic contents, 5,290 ft. each. Four, two rooms and kitchen; cubic contents, 7,300 ft. each.

Cost per house—one room and kitchen, £315; two rooms and kitchen, £435.

Note.—Cubic contents includes bath-room, bed-recesses, presses, scullery and lobby.

SEMI-DETACHED COTTAGES.

Number of houses, forty.

Size of houses—thirty-six, four apartments; cubic contents, 4,950 ft. each. Four, five apartments; cubic contents, 7,060 ft. each.

Cost per house—four apartments, £220; five apartments, £325.

Note.—Cubic contents includes scullery, water-closet, coals, pantry, presses and staircase.

These figures show—(1) that in this case the cubic feet in the two-apartment and three-apartment tenement houses are greater than in the four-apartment and five-apartment semi-detached cottages respectively.

(2) That with nearly the same cubic capacity, and much better allocation of the space, a semi-detached house built on economic lines may only cost from 70 to 75 per cent of a tenement house.

(3) That the saving shown in this type of construction will mean the whole difference between a moderate economic rent and one which is beyond the capacity or the willingness of the average workman to pay.

Of course, one has to recognise that the cost of a house is really the initial cost plus the amount expended on repairs during its life. Hence, a low initial cost is not necessarily cheap, if the construction is such that in the course of years substantial repairs will be necessary. Conversely, a substantial construction, which, though costing more at the outset, demands few repairs during its lifetime will be cheaper in the long run.

Both lots of houses above referred to were, however, substantially constructed, and one would say that the repairs would be negligible for a long time, though it is possible that the tenement would last longer than the cottages.

DISCUSSION OF MR. MACARTNEY'S PAPER.

Mr. Ross Young (Lanark County) said they had some housing schemes going on now. By one of the schemes they were building 100 houses, by another scheme fifty houses, and he had had occasion to go into the questions raised by this paper, and, on the whole, he agreed with it. There was no doubt, if they wished to build houses for the workmen, of the cottage type especially, they must use every endeavour to cut down expenses to the very lowest minimum. He was, however, satisfied that, if cottages were erected economically, they could house the working classes as cheaply in cottages as in tenements. There was an impression in the past that the house in the tenement was cheaper than in the cottage. Mr Macartney brought out some important figures in the paper when he showed that a one-room and kitchen house in a tenement cost £315, while a four-roomed house in a semi-detached cottage cost only £220, or nearly £100 less. Those were figures to take home with them and think over. Mr. Macartney made the statement, in choosing the site of cottages, that busy, important streets should be avoided, and sites fronting possible costly new streets should also be looked on with disfavour. He quite agreed. If they were going to house their workmen in cottages they must get away from the old crystallised idea that it must be in a wide street. He was in favour of wide streets—he would like to see the main streets 140 ft. wide; but it was not necessary for streets for workmen's

cottage. Mr Macartney said it was not necessary to have the houses fronting to a wide road. He was glad to see that Mr Macartney had advocated this cheap method of laying out houses for workmen. If workmen's houses were to be built on the cottage type they must reduce the expenditure on huge, wide tracks of macadam. Give a man garden ground in front of his cottage, and he would cultivate it.

Mr. A. H. GOUDIE (Stirling) said there was one thing he wished to ask a question about. Mr. Ross Young seemed to make a great point about the cost of the semi-detached cottage being much less than the tenement house, but it was possibly a very much smaller house than the tenement house. The cost of the tenement house, one room and kitchen, was given as £315, against the cost of the four-room cottage, £220. The tenement was described as substantially built, with dressed-stone front, tiled close, good fittings, and ceilings of over 10ft. It was very unusual to build tenements with ceilings of over 10 ft. high. That must have increased the cost to some extent. At the same time, £315 seemed very high for a house of one room and kitchen. Supposing they had a tenement with six one-roomed houses, the cost of the tenement would be £1,890. That seemed to him a very extraordinary price, and he would be pleased to have some further explanation. The question that had been discussed by some members of doing away with the tenement altogether, and going in for semi-detached cottages, might answer so far as the counties were concerned and some of the small towns, but in some of their very old towns, such as Stirling, it was impossible. They had a slum area in the centre of the town which they had had to purchase, and would rebuild as soon as the value of money dropped a little. In that area, in the middle of the town, they were doing their best to give good, healthy houses, but it would not be suitable to build cottages in such a case as that. They must recognise that in some cases tenements must go on, and the question which they had to decide was whether they could build houses as cheaply in a tenement as in a semi-detached cottage, and he held it was quite possible.

Mr J. LEE (Dundee) said he would like to have exact figures as to the cost of these four-story tenements. The tenement with eight houses of one room and kitchen at £315 came out at £2,520. The tenement with four houses of two rooms and kitchen, at £435, came out at £1,740. Thus, two tenements cost £4,260. Was that right?

Mr. MACARTNEY: That is right.

Mr LEE: He must have been a philanthropist who built it.

Councillor SMITH (Coatbridge) said he felt that in municipal housing the county and borough engineers had yet something to learn. He did not think they had much experience in the building of houses. (Cries of "Question.") They had a committee in the burgh of Coatbridge considering this question, and therefore he would like to get some light upon it. They were busy displacing a good many people from houses which were not in a proper condition, and he feared if they were put into new houses they would, in many cases, soon make them in the same condition. It was not only the houses, but the tenants were at fault. He thought it should be possible to let the new houses to those who were now in decent property, and thus lift all the people a little higher in their housing conditions. They had got to educate people how to use a decent house. There must be something wrong with the figures as to the cost of the tenement house. It was given for four houses of two rooms and kitchen as £1,740. He was prepared to give them a guarantee that he would do the work for £850. He thought in many respects the English had brought their building regulations down too low, and if they in Scotland copied them they would get out of the frying-pan into the fire, and have houses which would not last very long.

Bailie AGNEW (Coatbridge) regretted that Councillor Smith had made observations which he could not possibly accept. He thought the municipal engineers were to be congratulated on these two papers dealing with town planning and housing, considered particularly from the Scottish standpoint. He was especially pleased to hear Mr. Bryce express himself strongly with regard to the amount of propaganda work that had been done in Scotland by English enthusiasts. He had nothing to say with regard to the education they might receive in housing questions; but he did believe that in Scotland, notwithstanding the fact that they might be slow in the matter, it was better in the long run that they should solve their own problem on the lines and in the way that experience in Scottish districts would lead them along. It was better that they should learn by their own experience than follow English lines. He thought the municipal engineers might be influenced to establish a conference to include in greater measure than in past years papers on the subject of town planning and housing, so that they might have papers dealing with the question from Scottish experience and Scottish ideals emanating from them. That would be a great advantage to the representatives who would be influenced, to a large extent, by their technical officials. He wanted to say, as to tenements versus cottage dwellings, that they were not prepared to adopt in Scotland a system of cottage dwellings. What they had to take into consideration was that the conditions prevailing in Glasgow were not the same as prevailed in the smaller provincial towns. Mr. Bryce had knocked a story off his four-story dwellings, and they in Coatbridge would be prepared to knock off another story. What he would be inclined to do was to reform the tenement, so that it could express itself in a way other than in a long row of dwellings in a street which was drab and uninteresting. Instead of continuing these tenements in a long row, he thought it was possible, by breaking them up into a small number of buildings, to allow the tenement system to express itself in a variety of ways, and so solve the problem without plunging into the English system. One thing he did think they should not subscribe to, otherwise, if they did, all the work they might do would have the stamp of failure on it; if they believed there was any large section of the people who were unworthy to be properly housed, then their business was not to discuss housing questions at all, but to leave them as they were. He wanted to make that point because he could not subscribe to the statement that there was any large section of the people who were not worthy of any effort to solve the question of housing. He believed the municipalities, in solving this question of housing, would solve a problem which would give them and the people the greatest satisfaction.

Mr J. BARKER (Dumfries) said the action proposed was not sufficiently strong, considering the urgency of the case. He thought that the housing of the working classes would fall entirely into the hands of the municipal authorities. There was a general complaint of the lack of enterprise by builders to put up houses, and he was not surprised, because houses were not a profitable investment. He knew of a case in which a tenant went into a new house, and on leaving after three months over 300 nail holes were found in the walls, which had caused considerable damage. With regard to municipalities which undertook building schemes, he contended that they should build to the standard which they insisted upon in the case of private builders. Then one principle which should always be observed was that the building schemes should be self-supporting, and not be a charge upon the rates. Unless that principle was strictly observed he thought it was hopeless to expect that any municipal housing scheme would ever be satisfactory. In Dumfries they started a scheme two years ago to build forty-eight houses, at a cost of £150 each. Their building had cost them 4½d. per cubic foot. They were let at a rental which would meet the interest on and repayment of loans, and there had been no difficulty in letting. The housing of the working classes in Scotland was of a most unsatisfactory character, and one of the chief duties of a municipal engineer in future would be to design workmen's dwellings. If it was put in the hands of the members of that institution they might hope for quite good results.

Mr. R. LINDSAY (Edinburgh) said in his view there was something wanting with regard to town planning and housing. What they wanted to do in the first place was to fix a standard by which they could regulate the type of house that was wanted. That done, one half of their difficulty would be solved.

Provost LANG (Johnstone) said he was particularly pleased to know that the suggestion he threw out to Mr. Macartney had been discussed in the paper. The question arose in an uncommon way. As chairman of the Belgian Refugees' Committee at Johnstone, he found that they could not take as many refugees as they wanted. At present there were no houses to let. During the past year a very considerable development in industrial works had taken place, and a large number of workmen could be taken on if there were housing accommodation. Being interested in works in which 1,000 men were employed, he sug-

gested to one or two of the foremen in the different departments that they might find out the feeling of the men as to whether they preferred to live in tenements or cottage property. The foremen were more than surprised to finn that cottage property was very popular.

Mr. R. S. Macmillan (Clydebank) stated that in his burgh they had in hand a scheme of the two-story type of dwelling, four to eight houses in one block. These houses were quite distinct from the tenements.

Mr. J. Weekes (Irvine), describing some houses which he had recently visited, stated that the kitchen, which was about 12 ft. in width, had no fewer than four doors, while there was a window on one side and a fireplace on another. What he wanted to know was where a place was to be found for a bed, for, as they knew, the Scottish workman liked his recess bed. Mr. Weekes concluded with some observations of the English practice of placing the water-closet of houses off the scullery.

Mr. Macmillan remarked that two cottages built from one of the *Country Life* competition designs were to be seen at Clydebank. These had been most successful, and in those cases the water-closet was off the scullery.

The President (Mr. J. S. Pickering) said their thanks were due to Mr. Macartney for having contributed so valuable a paper to the "Proceedings" of the institution. The discussion would be most profitable to them all. His view was that the question would have to be settled by each individual district. Conditions which applied to one did not apply to another, and one had to be guarded about adopting general rules.

Mr. Macartney agreed with the president that the subject was one which had to be settled by each community and district. There were all sorts of varying conditions which came into play, and which had to be considered. He did not think he would say anything about the discussion. Some of the matters referred to had not been dealt with in the paper, but two members, Mr. Goudie and Mr. Lee, spoke of the question of cost. He could assure Mr. Lee the figures he had given in the paper were quite correct, for he obtained them from the man who paid for the property—who ought to know. Without giving any particulars as to the locality in which they were designed, he would say that he thought the property was badly designed. The ceilings were 10 ft. 3 in. and 10 ft. 6 in. high, and the planning had to be done carefully for the work to be carried out at all economically. Fittings took up a great deal of space. The cubic contents were tremendous, and yet there was nothing to show for it. That was the reason for the high cost. He had thought the information would show them what not to do. They learned more from failures than successes, and it would be a warning for them in the future.

LUNCHEON.

The members were on Friday afternoon the guests of the County Council at luncheon, the convener of the county, Councillor W. D. Russell, presiding over the gathering.

In welcoming the institution, the Chairman said his only wish was that the visit could have taken place under different circumstances—when peace and goodwill prevailed among the nations. Proceeding to refer to road matters, he remarked that in Ayrshire they had to contend with very varying conditions as to subsoil, climate and rainfall. In that particular area the subsoil was particularly good, and the rainfall was not exceptional. In other parts, however, they had to deal with clayey and peaty subsoils and double the rainfall. At the same time he was bound to say their road surveyors were a most capable and energetic set of men. All they desired to do, and did do, was to carry through their work in the most efficient manner and provide the best roads they could. The manner in which they performed their duties was very much appreciated, and he had much pleasure in saying so. In Ayrshire they had a very large amount of heavy motor-traffic over their roads, and he hoped that means might be found by which those who were responsible for that traffic would be made in the future to contribute justly and fairly to the upkeep of the roads they destroyed. He thought those present would agree that they did not get grants to the extent they should do from the Road Board in London. When such grants were given they were so fenced round with restrictions and stipulations that he thought steps ought to be taken to press for easier conditions. He thought they might, at any rate, be treated as honest men, and be allowed to spend money as they thought best for their various districts. That, he was sure, would make for smoother working.

The President (Mr. J. S. Pickering), in returning thanks, observed that the programme before them was a proof of the enthusiasm of the Scottish members. The several papers were of the greatest interest and importance to public authorities, and he had no doubt in his mind as to the wisdom of councils giving every encouragement to their officials to attend such meetings. No municipal or county engineer could possibly do his duty to his authority unless he made himself familiar with the works that were being carried out by his confrères in other parts of the country, and it was with the object of acquiring information of a useful character that their institution existed. He regarded the reception which had been accorded them that day as an indication of the sympathy of their hosts with the objects they had in view, and he was sure they would all look back on their visit with the pleasantest of recollections.

The annual dinner of the Scottish District was held in the evening at the Station Hotel.

(To be continued.)

EASTERN DISTRICT MEETING AT SOUTHALL.

The members of the Eastern District met at Southall on Saturday last, and were received in the town hall on behalf of the Southall-Norwood Urban District Council by the chairman, Mr. James Culley. After the formal proceedings a brief business meeting was held, and subsequently visits were paid to the open-air bath and the sewage disposal works, the meeting concluding with the discussion of papers by Mr. Reginald Brown, the engineer and surveyor to the urban district council ("Fourteen Years' Municipal Work in a London Suburb") and Mr. J. H. Edmondson ("Fitting Up and Working of a Sewage Works Laboratory"). The attendance included Messrs. H. T. Wakelam (Middlesex County), district chairman, J. A. Webb (Hendon Rural District Council), hon. district secretary, W. Gornall (Hendon Rural District Council), W. H. Taylor (Aylesbury), W. R. Locke (Hemel Hempstead), S. F. Dunbar (Hemel Hempstead), J. W. D. Needham (Hemel Hempstead), M. Hainsworth (Teddington), S. H. Chambers (Hampton), T. D. Smith (Kettering), W. B. Chancellor (Barnet), H. E. Ames (Barnet), C. G. Hall (Metropolitan Water Board), W. L. Carr (Ruislip-Northwood), D. C. Fidler (Hayes), J. W. Harrison (Uxbridge Rural), P. Harrison (Middleton, Lancs), S. W. Barnes (Hanwell), E. Willis (Chiswick), R. R. Hogoden (Southall-Norwood), J. B. Thomson (Southall-Norwood), R. Brown (Southall-Norwood), R. L. Honey (Chatham), H. F. Wilkinson (Tottenham), E. Seabrook (Hendon Rural), P. T. Harrison (Chelmsford), S. F. R. Carter (Beddington and Wallington), J. G. Carey (Heston and Isleworth), J. B. Bond, H. Knight (Brentford), Reginald Brown (Southall-Norwood), and J. H. Edmondson.

We report herewith the business meeting and discussion. Of the two papers we reproduce this week that of Mr. Edmondson, reserving Mr. Brown's paper for a future issue.

Mr. James Culley (the chairman of the Southall-Norwood Urban District Council) welcomed the members of the institution to Southall, and made brief reference to some of the municipal undertakings carried out by the council. These included open spaces and an underground convenience, which were a credit to Mr. Reginald Brown, the surveyor. The sewage disposal system also, he thought they would agree, was a fine piece of workmanship. It had been carried out in spite of the fact that the district had a low rateable value, but it could not have been accomplished if there had not been good co-operation between the council, [illegible] officers. The [illegible] scheme, which was in abeyance, had entailed a great deal of work upon Mr. [illegible], and they hoped it would [illegible] of its kind in the country.

The chairman of the Eastern District, Mr. H. T. Wakelam (county engineer of Middlesex), then took the chair which was vacated by Mr. Culley, and on behalf of the members moved a vote of thanks to that gentleman, which was seconded by Mr. E. Willis (Chiswick), and carried with acclamation.

Mr. J. A. Webb (hon district secretary) then read

the minutes of the previous meeting, which were duly confirmed.

Mr. WAKELAM referred to the election of Mr. Webb as representative of the Eastern District, and moved a vote of thanks to him for his services in the past. Mr. Webb [illegible] had won him the esteem of all the members of the district. They [illegible] he would continue to render them valuable service.

Mr. WILLIS seconded, and remarked that, thanks to the [illegible] courteous disposition, Mr. Webb had been able to discharge his difficult duties without the slightest complaint.

The vote was passed with unanimity, and Mr. Webb, in acknowledgment, said he hoped to continue to be of service to them, and that his duties would permit him to attend with regularity the meetings of the council.

Mr. WAKELAM, in formally moving a vote of thanks to Mr. Reginald Brown for his paper, announced that he would not be able to be with the members all day, as he had to visit another part of the county. He [illegible]

MR. REGINALD BROWN, M.INST.C.E.,
Engineer and Surveyor to the Southall Urban District Council.

for many years as one who had aptitude in his profession, and great qualifications for carrying out his duties. He did not think they could improve upon Mr. Brown's record in so far as his work in connection with the [illegible] was concerned, and it was very pleasant to find that the relations between the members of the Southall-Norwood Urban District Council and the officials were so satisfactory. With regard to heavy motors on traffic roads, there was, as they were aware, a Departmental Committee sitting. He (Mr. Wakelam) had given evidence before it on behalf of the County Councils Association and the council of the Institution of Municipal and County Engineers, and from what he had been able to gather there would be some alterations and improvements effected in respect of the diameter of wheels and the width of tyres. The vote of thanks which he proposed would be seconded by some speaker in the discussion after the members had returned from visiting the open-air swimming bath and the sewage disposal works.

After the visitation the members were served with tea, kindly provided by Mr. Brown, and upon reassembling in the council chamber Mr. E. Willis was voted to the chair.

Mr. WILLIS seconded the vote of thanks to Mr. Brown, and took the opportunity of thanking the members of the Eastern District for having elected him to the council for the forthcoming year. He also proposed a vote of thanks to Mr. J. H. Edmondson for his paper, which was seconded by Mr. P. T. Harrison (Chelmsford), and agreed to.

Mr. S. H. CHAMBERS (Hampton) remarked that at Southall they had a complex sewage problem to deal with, and Mr. Brown seemed to have tackled it in the right manner by going to the root, and thereby obtaining wonderful results. The effluent they saw was very good. Some of them did not turn out such good effluents, and he was really surprised at the small amount of suspended matter. Of course, they accepted Mr. Brown's figures, and also his conclusions. He was also interested in the open-air swimming bath, which must be an acquisition to such a district, and of which Mr. Brown had made a very good job. He did not know anything about the facts of the case, but the cost of the bath (£1,500) appeared to be really high. Probably there were reasons; but he noticed many little things which he (Mr. Chambers) could not afford which Mr. Brown had put in. Probably the water supply connections were rather expensive. It would be interesting to know why it had been considered necessary to have waterproof sheeting. With regard to the housing scheme, they had not seen it in a mature condition, and he should therefore leave any remarks he might have to make to a future occasion.

Mr. S. W. J. BARNES (Hanwell) said he had always found Mr. Brown a good neighbour, and as to his schemes, they bore the impress of a man who went thoroughly into his work and carried it out top hole. On the subject of the removal of house refuse, he (Mr. Barnes) found this a very expensive thing in his district, and he was not able to do the work at the figure quoted by Mr. Brown. Perhaps Mr. Brown would tell them the distance he had to cart his refuse, whether the collection was weekly, whether there was an understanding that the bins should be carried out to the front of the house, or whether the men had to carry them to the front of the house.

Mr. W. B. CHANCELLOR (Barnet) observed that, with regard to the filters, he had had the opportunity of asking Mr. Brown one or two questions, but he omitted to ask whether he had pooling, or whether there was any disintegration of the filtering media. It was possible to get better results from filters filled with large media than with small. A fine gauge gave better results in the initial stages, but it was costly, and necessitated cleaning and renewing. Judging from the analysis of the sewage, it was not a very strong one. Had Mr. Brown ever tried treating it on purely septic lines? He had tried both, and he was convinced it was infinitely better with septic treatment than with chemical precipitation. He congratulated Mr. Brown on having induced his council to engage a chemist. There were some of them who were not so fortunate. He would like to ask Mr. Brown why he made up private streets with Kentish flints and the subsidiary streets with tar-macadam. It would, he thought, have been better to have the private streets made up originally with tar-macadam. The owners would not object to spending a few pence per foot more. Then, again, did Mr. Brown prefer slag-macadam to granite-macadam? Also, what was the depth of hardcore in private streets? He thought the Southall Council were particularly generous in supplying the householders with galvanised dustbins. He noticed that Mr. Brown did tar-spraying for a halfpenny per square yard. Did that include chippings? As to the housing scheme, was it intended to be self-supporting?

Mr. T. R. SMITH (Kettering) asked questions with respect to the system of sewerage and the filling of the filter-beds. With respect to the latter, he wished to know what percentage of material Mr. Brown found useful, and whether the clinker turned out satisfactory. As regarded sludge, Mr. Brown was to be congratulated upon having a market for it which was rising. At Kettering they introduced the septic system, and found that they had to deal with about half the quantity of [illegible] they had before. As regarded the highways, he might say that at Kettering they dropped oil tar and took to tar-spraying, though he was bound to say he was pleased with oil tar, as it gave a more cheerful appearance to the roads than tar-spraying.

Mr. M. HAINSWORTH (Teddington) inquired if Mr. Brown found any nuisance arising from flies or smell in connection with the percolating filters. He thought Mr. Brown's figures with respect to the cost of private streets were remarkably small. He could not do the work anything like so cheaply. Was the kerb found by the owner when the streets were laid out? As to refuse disposal, he agreed with Mr. Brown as to the provision of dustbins. When all kinds of receptacles were in use the work was not facilitated. With regard to the open-air baths, he thought they were on a par with all the work they had seen at Southall, and as to the cost, doubtless Mr. Brown would have some explanation to offer. The difficulty he (Mr. Hainsworth) had was to find a site for an underground convenience, and the fact that at Southall they con-

structed the convenience under the town hall showed the character of the council and engineer in dealing with a problem which was always a difficult one.

Mr. P. T. Harrison (Chelmsford) asked, with regard to storm water, whether any attempt was made to purify the first washing. With respect to refuse collection, he noticed that two men went with the carts. Time was lost by the method of having two men, because they had both to go to the tip, or else one went to the tip while the other did—well, he did not know what. He congratulated Mr. Brown upon the site and lay-out of the housing scheme, and he should say that it promised to be a success. Reverting to refuse removal, he feared there would be a loss of time unless something was done to bring the receptacles to the front. He had nothing but praise for the sewage works. He did not know whether it was feasible to extract a large amount of fat that found its way to sewage works. He believed it was done in the North. At Chelmsford, he might say, with respect to air raids, that they had formed an auxiliary brigade of fifteen men, with dark uniforms, whom they insured against accidents, and though they hoped their services would not be required, they were doing what they could to provide for emergencies. He congratulated Mr. Brown upon the relationship subsisting between his council and the officals, for it showed that they worked together for the welfare of the district. He had known cases—not at Chelmsford—where it was not so.

The Vice-chairman of the Barnet Council inquired if the Southall Council obtained a loan for the sprinklers or if they paid for them out of the rates. As regarded road sweepings, were these carted to any point, or were they offered to the ratepayers? He must say that the Southall Council seemed to support the efforts of their engineer very well.

The Chairman (Mr. Willis) referred to the rapid increase of the population of Southall, and also to the fact that property of the working-class type was, unfortunately, responsible for a large education rate. The council, however, had the foresight to acquire open spaces, and by town planning endeavoured to anticipate the wants of the district in the future. He congratulated the district upon a low death-rate of 8·8 per 1,000 for last year. In pointing out that the success gained was largely due to attention to small details, the chairman said he wanted the younger members—and he spoke, for the moment, as one of the examiners of the institution—to give attention to details. The lack of this was the cause of the failure of most students in the past. He had had a large experience of sewage purification at Willesden, and he might say that before the sewage of that district was turned into the London County Council system they turned the precipitation tanks into open sedimentation tanks wih excellent results. The difficulties were great. On one occasion, in the summer, he found the effluent was actually six times the volume of the river. As regarded the size of the clinker, he endorsed the statement of Mr. Chancellor, that the larger clinker gave better results, even in contact beds. At Willesden they had a combined system, and at Chiswick they had lately carried out a separate system. The difficulty was to get separate houses provided with separate drains. It could not be enforced, and all they could do, where the drainage was to be relaid, was to use persuasive powers. The law, however, would have to enforce it. With respect to dust-bins, it was difficult to institute the system in the larger districts owing to the cost. In his district the estimate of cost was £2,500, and the council could not see their way to do it, as they would only get a loan for a year or two. At Chiswick their refuse collection was by day work and contract labour, the council supplying the horses and finding the usual equipment. They found this system much cheaper than the other system, and he did not think there were more complaints than under the old system. He congratulated Mr. Brown upon his sewage charts because it was possible to see from them the variations in the quality of the sewage and the percentage of purification from year to year. He would like to ask how Mr. Brown governed the period of changing the water in the bath. An analysis of the samples of water pointed to the advantages of an open-air bath over a closed bath. In connection with private street work, he should be glad if Mr. Brown would give them the method of construction. At Chiswick they had used flints, and tar and granite macadam, according to the foundation. They had power to have a foundation of 21 in., but in practice they were generally satisfied with 18 in. They also made a practice of tar-paving in private streets, whether of flint, granite, or tar-macadam, the cost being chargeable to the owners. With regard to the dock, he regarded it as a most useful acquisition to a local authority which adjoined a canal or river. Had Mr. Brown any special provision for unloading? And, if so, what were the charges? In the matter of road sweepings, he might say that at Chiswick they made a practice of selling them to ratepayers who wanted them at a fixed charge of 1s. 6d. per load. They made the stipulation that the money should be prepaid. It was no benefit or saving to the council, but a slight benefit to the ratepayer. He would sound a note of warning with regard to road sweepings—viz., that the sweepings of tar-surface roads were not to be desired.

Mr. Reginald Brown, in reply to the discussion, said, with respect to the open-air bath, that he was one of those who believed that, unless special precautions were taken, contract work did not yield satisfactory results. So far as the waterproofing was concerned, it seemed to him only reasonable that you should construct your bath so as to waste as little water as possible, or none at all. He did not think that one drop of water was lost out of the bath, and he had always seen the water at the same level. On the question of the removal of house refuse, he agreed that the method adopted at Southall was probably the most economical that could be adopted, though he was not going to say it was the best or most sanitary one. They provided the ratepayers with a dustbin, saw that it was emptied every week, dusted it with carbolic powder, placed the refuse in a sanitary dust-cart, and tipped it in somebody's back garden. Immediately on the boundary of the district there was a large brickfield whose owners would take all the refuse they could get. The council provided the cart and one man, and the contractor supplied the horse, harness, and one man. He agreed that the cost of cartage was a serious item. Half the time of the man was occupied in going to and from the shoot, and this was serious. Somebody asked what the other man did. He (Mr. Brown) took care he did something useful, because while one man was engaged in collecting the other was engaged in sweeping the street. The cost was really the first cost. They used to have filthy ashpits in the district, and the council thought it would be better to take the bull by the horns and purchase the dustbins, whose average life was ten years. As to pooling on the surface of the filters, this occurred in one or two instances, and it was due solely to the action of the men. They never saw any disintegration of the filtering media. The media, he might state, consisted of medium-sized clinker. It was better that sewage should pass over clinker in a fine stream than a thick stream. He was pleased to hear the remarks made in approval of the council engaging a chemist. With respect to private streets, he thought the cost of construction fairly reasonable. He was told they spent far too much money on private streets. Up to the present they had never, or only once, made up private streets under the new by-laws of the council. Now they required that a granite-block channel as well as kerb should be put in for private streets. The streets referred to in the paper were constructed under the old by-laws, which required a kerb only. That worked out at from 6s. to 10s. per foot where no channel is provided, and 7s. 6d. per foot-run when channel was provided. It was asked why not use tar-macadam for private streets. The only answer to that was that, before they called upon owners to make roads in a particular way, the council should set an example themselves if they did not wish to have complaints. He thought they could make private streets with tar-macadam quite as cheaply as with flint and granite. He might say that they had some magnificent local flint within a few miles of the district. They had an entirely separate system of sewers. They provided the main sewer, and every person who built had to provide two sets of drains, and they allowed twelve houses to go into one drain. They might say this was a dangerous thing to do, but they had done it for twenty years, and it had probably cost something like £2 for the maintenance of the sewers. He thought he was right in saying that not more than 5 per cent of the clinker taken out of the beds was wasted, the remainder being sludge. He had purchased his clinker media at 3s. 4½d. per cubic yard. The sludge difficulty was difficult to solve, but he believed further experiments would prove that, in the case of particular lands which were deficient in lime, the application of sewage sludge would make them more valuable, especially grass lands. The oil tar at a halfpenny per yard

not used with cinders, except to make thoroughfares. It used to cost a farthing, but the cost of it had increased. As to the housing scheme, he might say that he was intended to be self-supporting—that was with him a fundamental principle. The roads could not be carried unless there were to be the cottages. Land was purchased at £100 an acre, and the scheme was only possible by reason of the admirable site, and the fact that there would be very little road construction. They were utilising existing roads, and getting the back land for open spaces, which, he thought, every landowner ought to provide. They had no nuisance, or very little, from the sewage works. Flies they did get, but the works were so constituted that they had no trouble with them. The sprinklers, he might add, were obtained by means of a loan. As to road sweepings, if there was no call for them from the ratepayers they were carted to the depots. If a ratepayer required them from the depot a charge of 2s. per load was made for carting. There was no special provision for unloading at the depot. They hoped to have a destructor at the dock, and there would be cranes for loading and unloading barges.

Mr. EDMONDSON, who received a vote of thanks for his paper, gave a brief address, and the proceedings closed.

COUNCIL MEETING.

A meeting of the council of the institution was held at 92 Victoria-street, Westminster, on Saturday, May 29th, those present being Messrs. J. S. Pickering (president, in the chair), J. Patten Barber, W. N. Blair, J. A. Brodie, J. S. Brodie, G. F. Carter, A. E. Collins, E. J. Elford, W. Harpur, T. W. A. Hayward, W. T. Lancashire, Sir James Lemon, P. H. Palmer, Norman Scorgie, H. T. Wakelam, C. F. Wike, O. E. Winter, the consultant secretary, and the secretary.

THE MEMBERSHIP ROLL.

The following candidates were elected:—

Members: Messrs. J. Bowen, borough engineer and surveyor, Reading; J. Cullen, water engineer, Eastern District, Stirlingshire; J. K. Frazer, burgh surveyor, Airdrie; E. A. Green, chief building surveyor, Sheffield Corporation; E. J. Hamlin, town engineer, Stellenbosch, Cape Colony; H. Hudson, engineer and surveyor, Chesterfield Rural District Council; J. W. Jones, deputy borough engineer and surveyor, Lyme Regis; J. Lang, county road surveyor, Kilmarnock District of Ayrshire; R. McDonald, road surveyor, Ayr County, Northern Division; J. F. McGahon, surveyor for Carrickmacross Urban and Rural District Councils; A. J. Mildon, surveyor to the Tiverton Rural District Council; F. T. Negus, deputy city engineer and surveyor, St. Albans; A. Simpson, burgh surveyor, Troon; and W. Starkie, surveyor to the Welton Rural District Council.

Associate-members: Messrs. R. C. Muir, second assistant engineer, Office of Public Roads and Highways, Province of Ontario, Toronto; and G. W. Spurring, assistant borough surveyor, Harwich.

Students: Messrs. B. F. Holness, engineering assistant to the Watford Urban District Council; M. W. Lashmar, surveyor's office, Cowes Urban District Council, Isle of Wight; G. Nayler, city surveyor's office, Hereford; and L. O. Wilkes, town surveyor's office, Redditch.

Transfer from Associate-member to Member: Mr. J. H. Castle, engineer and surveyor to the Goole Urban District Council.

LETTERS OF CONDOLENCE.

It was resolved to express the sympathy of the council with the families of the late Messrs. W. A. Collins, J. Rush Dixon, T. B. Farrington, R. Hara, and M. H. Sykes.

AWARD OF PREMIUMS, 1914-1915.

It was resolved to award premiums of three guineas each to Mr. W. B. Acton, for his paper on "Tropical Hill Roads"; Mr. E. H. Collcutt, for his paper on "Bituminous Carpeting Plant"; Mr. W. J. Goodwin, for his paper on "Some Notes on the Municipal Works of Salisbury"; Mr. A. S. Parsons, for his paper on "Recent Highway Bridges in Birmingham."

BADGE FOR VICE-PRESIDENTS.

A suggestion received from the Scottish District for the provision of a badge for vice-presidents was considered, and it was resolved that vice-presidents should be presented with a certificate similar to the President's Certificate, with the necessary alterations in wording.

NATIONAL ROAD CONFERENCE AND EXHIBITION.

It was resolved to appoint Messrs. J. S. Brodie, P. H. Palmer, R. J. Thomas, H. T. Wakelam, C. F. Wike, and O. E. Winter to represent the institution at the conference.

EXAMINERS' REPORT.

The Acting Examiners' Report on the examination held on April 22, 23 and 24, 1915, was received, and it was resolved to award the testamur of the institution to the following: Messrs. T. F. Allen, M. A. Asrani, J. A. H. Burford, H. Cliffe, P. I. Davies, C. E. Evans, J. S. Featherstone, P. Harrison, H. N. Letherby, W. Melville, N. J. Modi, G. F. Norris, H. Nurse, T. L. Parkes, J. A. Riccomini, J. Turrill, W. H. Veal and W. A. Walker.

DEPARTMENTAL COMMITTEE ON HEAVY TRAFFIC.

The secretary reported that Mr. Frank Harris had been co-opted as a witness to give evidence to the Departmental Committee on behalf of the institution.

MUNICIPAL ENGINEERING APPOINTMENTS DURING THE WAR.

The secretary reported that, as a result of the representations made by the council, the Local Government Boards of England and Ireland had issued circulars drawing the attention of local authorities to the desirability of safeguarding the promotion and advancement of officials on active service.

NATIONAL ROAD CONFERENCE AND EXHIBITION, 1915.

PROGRAMME.

The following is the arrangements for the forthcoming Road Conference and Road Exhibition in London organised by the County Councils Association:—

Friday, June 25th.

4 p.m.—Official opening of the exhibition at the Royal Horticultural Hall, Vincent-square, S.W., by the Right Hon. Walter Long, M.P., President of the Local Government Board.—Chairman, The Right Hon. Henry Hobhouse.

Monday, June 28th.

2.30 p.m.—Conference on "The Use of Tar, Pitch and Bitumen in the Construction and Maintenance of Roads, with special reference to the subject of Corrugations." Papers by Mr. Percy J. Sheldon, M.INST.C.E., county surveyor, and Mr. Alfred J. Lyddon, ASSOC.M. INST.C.E., deputy county surveyor, of Essex, and by Mr. G. H. Jack, county surveyor of Herefordshire.—Chairman, The Mayor of Westminster.

Tuesday, June 29th.

2.30 p.m.—Conference on "Heavy Traffic." Papers by Mr. Harcourt E. Clare, clerk of the Lancashire County Council, and Mr. Ernest J. Elford, M.INST.C.E., M.I.MECH.E., borough engineer and surveyor of Southend-on-Sea.—Chairman, Colonel G. Dixon.

Wednesday, June 30th.

2.30 p.m.—Conference on "The Classification of Roads." Paper by Mr. G. Montagu Harris, M.A., Barrister-at-law, secretary to the County Councils Association.—Chairman, Sir W. Ryland D. Adkins, M.P.

Thursday, July 1st.

2.30 p.m. Conference on "The Reconstruction of Roads in Belgium, with general reference to the injury done to roads by war operations and military traffic." Paper by M. Henri Vandervin, Ingenieur en Chef Directeur des Ponts et Chaussées de Belgique.—Chairman, His Excellency the Belgian Minister.

The conferences will be held in the Lecture Room at the Horticultural Hall, on the first floor.

The exhibition will be open every day from June 25th to July 1st inclusive (with the exception of Sunday), from 10 a.m. to 7 p.m.

Heavy Traffic.—A paper on the "Amendment of the Law and Regulations relating to Heavy Traffic on Highways" was read by Mr. Bromley Challenor at the annual meeting of the Rural District Councils Association on Wednesday, and a resolution was passed urging upon the Departmental Committee on Locomotives and Heavy Motor Cars (Damage to Roads) the necessity for such amendment as would prevent the serious damage to roads, and secure more effective control of the traffic.

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, assoc.m.inst.c.e.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

483. Bridge Construction.—How are the lengths of the four wing walls of a bridge and the horizontal angle between the bridge and each wall determined? ("Tico.")

484. Hydrostatics.—A square sluice opening, 3 ft. by 3 ft., is formed in the vertical face of a dam, and the upper edge of the opening is 6 ft. below water. Calculate the hydrostatic pressure upon the square area, and find the exact position of its centre of action. (A.M.I.C.E.)

485. Building Construction.—A casement window-frame is to be fixed in a cavity wall (10-in. stone facing, an inner facing of bricks, and a 2-in. cavity). Show clearly the methods of fixing, and any important features with respect to the relation between the window-frame and the cavity. (Mercian.)

486. Sewage Ejectors.—How would you test the efficiency of a pair of 100-gallon alternating sewage ejectors with motor-driven air compressors? (C. A. B.)

487. Structures.—Find, graphically or analytically, the maximum deflection in a steel lattice girder of the N type, supported at each end, under a load of W tons applied on the bottom boom at a distance of 24 ft. from one support. Span of girder, 72 ft.; six 12-ft. bays; depth of girder 10 ft. Take safe intensity of stress in the members as 5 tons per square inch, and Young's modulus E=13,000 tons per square inch. There is no counter-bracing. Neglect the weight of the girder itself. (B. K., *Newport.*)

482. Water Towers.—What are the objects of water towers, and how did they originate? Is there any book dealing with this subject? ("Rewot.")

Water towers may be divided into two groups—viz., first, those which act as elevated service reservoirs; second, those which serve as balancing or break-pressure tanks in a long pipe line of inverted syphons. The intermittent system of water supply, which involves the use of storage cisterns in the houses of the consumers, has fallen into disfavour, and a constant supply to reach the highest houses in the district where the water is consumed at an adequate pressure is necessary in most waterworks. The consumption of water in a distributing system varies from hour to hour, and reaches a maximum between the hours of 8 a.m. and 5 p.m.; on the average, it is found that rather more than twice as much water is consumed between the hours of 6 a.m. and 6 p.m. than between 6 p.m. and 6 a.m. Now, one of the functions of the service reservoir is to provide a storage of water at sufficient elevation so that during the periods of maximum demand the supply is satisfactory at all places in the district. Referring to the pipe or pipes connecting the storage reservoir to the service reservoir as the "supply" main, and the pipe conveying the water from the service reservoir to distributing system as the "distributing" main, then in an efficient waterworks the supply main should be large enough (with an allowance for increase of population) to supply the average demand measured over a period of twenty-four hours, while the distributing main or mains, as the case may be, should be designed so as to convey the maximum demand. Obviously, the distributing main will, in general, be of larger capacity than the supply main, and in a waterworks system which has no service reservoir the supply main is also a distributing main—a not very economical arrangement if an efficient supply is required. The service reservoir also provides an emergency supply that can be drawn upon in case of a breakdown in the supply main. Occasionally no suitable site with sufficient elevation can be obtained for the service reservoir, and it then becomes necessary to raise the service reservoir by placing it on a structure built on the highest ground available, and thus originates the water tower. Service reservoirs usually are able to supply two ordinary days' demand, but, in order to reduce their cost, water towers contain about one-quarter of a day's demand, or even less. They are constructed in masonry and reinforced concrete, and, in America, of iron and steel. Elevated service reservoirs of this description may also serve as break-pressure or balancing reservoirs; in any case, they ensure a more or less steady pressure in the distributing mains, which is independent of any increase of pressure that might occur in the supply main from one cause or another. As regards the second group of water towers, let the figure No. 1 represent in outline a pipe line consisting of several inverted syphons. The storage reservoir is situated at A, the service reservoir at B, while the line AB represents the hydraulic gradient. The points C and D represent intermediate hill-tops on the line of pipes, the point C lying on the line of the hydraulic gradient, and the point D is assumed to be somewhat below it. A tank is constructed at C, where the working pressure in pipe will be zero. A water tower is built at D up to the hydraulic gradient, so that working pressure in this tank is also zero. After a little consideration it will be clear that the

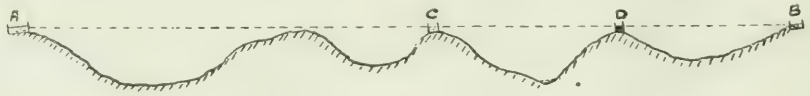

Fig. 1.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

480. Sewer Survey.—It is required to survey the course of an old brick sewer, 5 ft. diameter, which runs for 1,000 yds. in a very irregular line in a thickly populated district. There are no available manholes. How can this be done, and what instruments would be used? (W. S. W., *Chesterfield.*)

Mr. A. C. Turley, the borough engineer of Canterbury, writes:—

When acting as an assistant at Harrogate, I made a survey of an old sewer (which took a very tortuous course, and upon which there were very few openings from the surface) by means of a transit theodolite fixed on short legs. In some places the head room in this culvert was less than 3 ft. Practically I made a very careful traverse survey of the sewer, which was plotted to a scale of 16 ft. to an inch, and "fitted" at the terminals with wonderful accuracy. Two men assisted me; lighted candles were used at observation stations, a light being held over the centre of the sewer at each change of direction. To a man who knows how to use properly a theodolite I don't think I need say more. I [illegible] "W. S. W." be careful to have the ends of the sewer opened for an hour or so before he attempts to go through same, so that the foul gases may be got rid of. Should he require any further assistance I shall be pleased to give it if he will drop me a line.

The Surveyor
And Municipal and County Engineer.

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pressure in the inverted syphon connecting C and D cannot be affected by any alteration in pressure in other sections of the pipe line, such as might occur from the stoppage of flow, and that it is economical arrangement, inasmuch that the pipes may be designed with only sufficient thickness to resist the known hydrostatic pressure. A main pipe line can with advantage be divided up into several sections by the construction of balancing reservoirs at suitable points, and, at those points where the site has not sufficient elevation, water towers would be built. An example of this kind is the Norton water tower on the Vyrnwy aqueduct of the Liverpool waterworks. The pipe line in this case has been divided into six syphons connected together by balancing reservoirs. Between Cotebrook balancing reservoir and the Prescot reservoir the ground does not rise anywhere up to the hydraulic gradient. The distance between Cotebrook and Prescot being too great a length for one syphon, a balancing reservoir was erected on the top of Norton Hill, the highest suitable intermediate point on the route. The reservoir consists of a cylindrical steel-plate tank, 80 ft. in diameter, supported by an elaborate masonry tower of beautiful design, with basin-shaped bottom containing a maximum depth of water of 31 ft. Towers of this type thus provide a valuable source of supply in the event of failure in the supply at some point higher up on the aqueduct. Valuable information with respect to water towers is given in Vernon-Harcourt's "Sanitary Engineering," McPherson's "Waterworks Distribution," "Proceedings of the Institution of Civil Engineers," vol. cxxvi., pp. 60 and 61. (M. T. R., *Blyth*.)

Income-tax on Sewers. In the House of Commons on Tuesday the Secretary to the Treasury was asked if the Commissioners of Income-tax were charging all municipalities in Scotland income-tax on the valuation of their sewers, while the same tax was not being exacted from many cities in England; if some cities were being asked to pay the tax for three years, others for two years, and others for only one year; and, if any of these inequalities were found to exist, if the Government would postpone the collection of this tax until it could be imposed upon all cities alike. Mr. Montagu, the Financial Secretary to the Treasury, stated that sewers which were rateable were also chargeable to income-tax, and that the practice throughout Great Britain conformed to that principle. Replying to a further question, he admitted that at the moment the tax was charged only on sewers in Scottish towns, the reason for this being that the sewers were only rateable in Scotland.

ARTERIAL ROADS IN GREATER LONDON.

NORTH-WESTERN SECTIONAL CONFERENCE.

In connection with the scheme for arterial roads in Greater London, a meeting of the North-Western Sectional Conference was held on Friday afternoon last at the Local Government Board offices, Mr. Regester (Middlesex County) occupying the chair. There were also present Messrs. W. E. Riley (superintending architect to the London County Council), S. B. Sandford (London County), C. Pinkham (Middlesex), G. A. Lansdown (Kensington), A. R. Finch (Kensington), O. Street (Acton), W. H. Mills (Brentford), J. W. Croxford (Brentford), E. E. Ryder (Bushey), E. Willis (Chiswick), R. Willey (Ealing), W. R. Hicks (Ealing), A. W. Perkin (Greenford), C. Hopton (Greenford) J. A. Smith (Harrow-on-the-Hill), D. C. Fidler (Hayes), S. S. Grimley (Hendon), J. J. Bennett (Heston and Isleworth), F. M. Elgood (Ruislip-Northwood), E. J. Garner (Uxbridge), J. Southam (Watford), D. Waterhouse (Watford), C. R. W. Chapman (Wembley), O. C. Robson (Willesden), E. Herbert (London Society), H. R. Aldridge (National Housing and Town Planning Conference), W. H. Thompson (Roads Improvement Association), S. D. Adshead (Royal Institute of British Architects), Colonel Hellard (London Traffic Branch Board of Trade), and G. L. Pepler (Local Government Board).

ROUTES APPROVED.

A recommendation of the sub-committee with regard to the construction of a north circular road through the North-Western Section, from Edgware-road, by Gunnersbury-lane, to a point in Chiswick High-street, where the Brentford by-pass road commences, was adopted, subject to a length between Dog-lane Bridge and Harrow-road being settled in detail.

In the discussion on the recommendation, Mr. Robson said he understood that the conference had taken the view that it should not deal with questions of cost, but, in his opinion, it was essential that these questions should be faced forthwith in order to facilitate negotiations in regard to town planning schemes. He would like to know who was going to pay for the extra width of the arterial road—100 ft. suggested—over the by-law road—50 ft. Also the committee had made an excellent suggestion of a garden between the new road and the river Brent, but did not say who was to pay for it. Again, railway bridges would have to be widened, and neither his council nor the railway companies would pay for that.

The chairman said he was in entire sympathy with Mr. Robson's remarks as to finance and the probable attitude of local authorities in the matter. Speaking as chairman of the Middlesex County Council, he did not think that they were, under present circumstances, any more likely to put their hands in their pockets. However, it was premature to raise the question now, except to make it clear that, in approving these routes, local authorities had not committed themselves to any expenditure. The matter could properly be raised at the main conference.

Recommendations dealing with the construction of what is known as the Sunbury extension and the Western avenue were afterwards approved.

It was decided that the sub-committee should be reappointed in order that they may consider the best means of carrying out the approved routes, and keep in touch with and encourage co-operation between local authorities and between the other sectional conferences with regard to road proposals and town planning schemes, and that for this purpose they should be empowered to elect a small special committee to form part of a committee of the whole conference, if similar small committees are nominated by the other sections.

It was also resolved that the Local Government Board should be asked to obtain preliminary estimates, as soon as possible, of the probable cost of the respective improvements, so that, *inter alia*, in the event of unemployment, following the war or otherwise, information as to a useful outlet for labour will be readily available.

BUILDING LINES.

The question of building lines was next discussed, on a recommendation that powers should be given to the London County Council, and any county council, after consultation with the local authority concerned, to prescribe these to existing main roads subject to an appeal to the Local Government Board.

Mr. Willis spoke in support of the recommendation, as he had been instrumental in getting it adopted

by the sub-committee. The Middlesex County Council already had authority on the lines of the recommendation, and in his view it was a desirable power for county councils to possess.

Replying to a question of Mr. Robson as to whether the intention of the recommendation was to take out of the hands of local authorities the powers they already possessed as to building lines and to put them in the hands of the county councils, the chairman pointed out that the intention was made clear by the recommendation.

Mr. Aldridge said he desired the conference to consider where the proposal led to. The intention of the recommendation was to try to get an improved building line without paying for the set-back. He had taken the opinion of an experienced parliamentarian who told him that the House of Commons would never assent to such a proposal. The question of compensation was bound to come up. The Town Planning Act did give power to deal with building lines without compensation, but only in regard to space about buildings.

Mr. Croxford said he thought the county councils should only have the right to deal with roads to the upkeep of which they contributed.

The recommendation was adopted.

CALLING OF MAIN CONFERENCE.

It was resolved that the date of the main conference should be fixed by the chairman of the sectional conferences in consultation with the Local Government Board.

ASSOCIATION OF CONSULTING ENGINEERS.

ANNUAL GENERAL MEETING IN LONDON.

The annual general meeting of the Association of Consulting Engineers was held at Caxton Hall, Westminster, on Monday, May 31st, Mr. G. Midgley Taylor presiding.

The hon. secretary (Mr. A. H. Dykes) having read the notice convening the meeting and the minutes of the last ordinary general meeting, which were confirmed,

The chairman moved the adoption of the report of the committee, and stated that the association had recently elected several prominent engineers to membership, and from what could be gathered by conversation with consulting engineers generally, the association was held in high esteem, and it was confidently anticipated that in the near future a large accession to the number of members would take place. It was evident that the association occupied a very strong position, and in course of time, when the usefulness of the association became better known, it was anticipated that it would include in its ranks not only the majority of the consulting engineers in Westminster, but also in the United Kingdom. It was somewhat difficult to convey to the consulting engineers in the country all the work being performed by the association, but a perusal of the report would indicate that much useful work had been done in the past year, and that the committee were active in furthering the interests of its members.

CONDITIONS OF CONTRACT.

One of the heaviest works undertaken by the committee was a consideration of the model general conditions of contract issued by the Institution of Electrical Engineers, and to which considerable objection had been taken. It was felt that general conditions of contract should be applicable to contracts generally, and that works pertaining to the electrical branch of the profession should not require any special treatment. Accordingly the model general conditions put forward by the Institution of Electrical Engineers were compared with those generally adopted in other branches of engineering, and, as a consequence, serious objection was taken to some of the provisions of the model form. The objections were communicated to the Institution of Electrical Engineers, and the association were thanked for their views.

During the past year the Book of Professional Rules and Scale of Fees had been revised, and, judged by the number of applications received for the book, not only from members of the association, but from Government departments and the engineering profession generally, it had been found of great general utility.

The committee took every means in their power to maintain the best traditions of professional conduct, and in every case where advertisements appeared inviting engineers to send in applications and fees for carrying out engineering works, the committee communicated with the authority advertising, and stated that, by the rules of the association, its members were prevented from answering advertisements of the nature referred to. In one instance, an advertisement inserted by the Eastern Valleys (Monmouthshire) Joint Sewerage Board was dealt with by the association, and it is satisfactory to learn that the Institution of Civil Engineers also took this matter up, and issued a special circular on the subject, calling the attention of the members of the institution to the impropriety of engineers competing against one another in the manner described.

COMPETITIONS.

There were many matters which would engage the attention of the association during the coming year, among others being the question of whether it was proper for members of the association to enter into competitions for schemes for public authorities. The chairman stated that there was a divergence of opinion upon the subject, and it was probable the committee might decide to approach the Local Government Board and have the benefit of their views upon the subject. There was much to be said in favour of competitions to enable junior members of the professions to present schemes to local authorities, but the chairman stated his strong views that there was very much to be said against competitions as usually at present conducted, and the methods by which the successful competitor frequently obtained his work. It was thought, however, by certain members of the association that if competitions were conducted on proper lines there might be no objection raised by the association to its members entering for them, and the matter would be carefully considered and a report would be made to the members.

The chairman referred to the fact that, although membership of the association was confined to principals of firms, there were no fewer than five of its members serving with His Majesty's Forces. He viewed this as an extremely satisfactory condition of affairs.

The adoption of the report was seconded by Mr. W. J. E. Binnie, and carried unanimously.

The hon. treasurer, Mr. S. R. Lowcock, then presented his report, showing a balance in excess of expenditure of £64 16s., as compared with £13 4s. 8d. last year.

The adoption of the accounts was seconded by Mr. H. J. Rofe, and carried.

Four London and two country members of the committee having retired by rotation, the result of the ballot for the new members of the committee resulted as follows:

The four London members elected were—

Mr. W. Ll. Preece, M.INST.C.E., M.I.E.E.
Mr. W. J. E. Binnie, M.INST.C.E.
Mr. Ernest L. Mansergh, M.INST.C.E.
Mr. E. Brough Taylor, M.INST.C.E., M.I.MECH.E.

The country members elected were—

Mr. Walter Emmott, M.INST.C.E., M.I.E.E., Halifax.
Mr. F. W. Hodson, M.INST.C.E., Loughborough.

The chairman remarked that the committee would welcome the assistance of the new members, and he know they would do good work.

A long discussion then took place on matters of great importance to the profession, in which the chairman and Messrs. Binnie, Lowcock, Mordey and Campbell Swinton took part.

It is hoped to make a communication to the members with reference to these matters at a later date when they have further matured.

Votes of thanks to the hon. auditors, Messrs. Cash, Stone & Co., and the hon. solicitor, Mr. F. E. Wright, of Messrs. Faithfull & Owen, were then carried unanimously, and on the motion of the chairman the meeting closed with votes of thanks to the hon. secretary, Mr. Dykes, and the hon. treasurer, Mr. Lowcock, for their great services during the past year.

Russia and Birmingham Town Planning.—The town clerk, Mr. E. V. Hiley, has received a letter addressed to the Corporation of Birmingham from Mr. P. Migouef, librarian of the Technical Institute, Petrograd, requesting information respecting the town planning of Birmingham, and asking for documents generally dealing with the municipal work of the city. In reply the town clerk has forwarded to Mr. Migouef copies of the town planning literature and plans of the town-planned parts of the city.

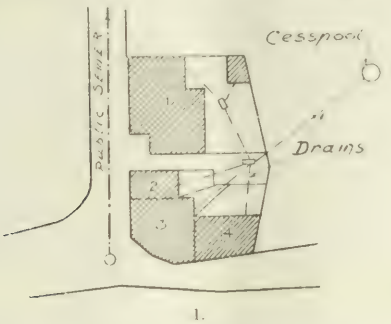
Law Notes.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to The Editor, at the office of THE SURVEYOR, *accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de plume." When necessary, a sketch of local features referred to should be provided. All explanatory diagrams must be drawn and lettered in* BLACK INK *only, and in such style as to be fit for direct reproduction (i.e., without re-drawing or amendment). Unless these conditions are complied with, we cannot undertake to reply by post.*

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should not be used.

SEWER OR DRAIN—CLAIM AGAINST LOCAL AUTHORITY.—"Rural" writes: The premises (numbered 1, 2, 3 and 4 as indicated on the plan) are separately held, under the owners, and were formerly drained into a cesspool, as indicated on plan No. 1. They have recently been redrained and connected to the public sewer, as indicated on plan No. 2. The re-



1.

draining was done when it was proposed to utilise premises No. 1 as a war hospital, and the expense was met by a private individual, who was anxious to see the premises adapted as soon as possible. A claim is now made against my council for the whole of the cost of the work, the contention being that the whole drainage system constitutes a sewer. I shall

2.

be glad to have your opinion as to the extent of the council's liability. I may say that previous to the redraining it had been reported to the council that the then state of the drains constituted a nuisance, and it was proposed to take action against the owner to have the nuisance abated.

(1) Only that part of the drainage system which took (or takes) the drainage of more than one building was (or is) a "sewer." See definitions in sec. 4 of the Public Health Act, 1875. (2) We do not think that the cost of any of the work can be recovered from the council in the circumstances of this case, the work having been done quite voluntarily. See *Ellis* v. *Bromley Rural District Council* (1899), 63 J.P., 711.

"NOTICE IN WRITING."—"F.W." writes: (1) Referring to "E.M.'s" query [THE SURVEYOR, April 23rd, p. 546], am I right in assuming that your answer was directed to the point as to whether a rubber stamp might be used, and not to the question whether the wording of the notice was in order? (2) Further, will you kindly tell me if under this section a notice exactly similar to "E.M.'s" is sufficient, and can be [illegible] the approval [illegible] of the plan has to be approved, and if the person depositing the plan has not begun to build within three years the council has then to declare the plan null and void?

(1) Yes. (2) The section appears to contemplate two distinct notices: first, a notice of the provisions of the section, which must be attached to the approval and second, notice in writing of a declaration by the local authority that the deposit of the plans or sections is of no effect. The latter notice cannot be given until the event has happened upon which the declaration can be made—*i.e.*, until the expiration of the three years. We are very doubtful as to the sufficiency of the form used by F.M.

REPAIR OF APPROACH ROADS TO LEVEL CROSSINGS.—"Northbank" writes further: I thank you very much for your helpful reply to my query in reference to the above, and shall be glad if you will allow me further to trouble you. The approach roads referred to in my previous communication are inclined "approaches," of which there are a number in this district. The railway company concerned is relying upon some (recent?) decisions, which are said to have relieved the company of the liability to maintain these inclined "approaches." The case quoted is "the judgment in the House of Lords in the action between the Sharpness New Docks and Gloucester and Birmingham Navigation Company and the Corporation of Worcester," which is said to have upheld the judgment in the West Lancashire case. Can you inform me if this is so?

The case referred to is reported in (1915) 31 T.L.R., 254, and turned upon the construction of sec. 61 of the Worcester and Birmingham Canal Act, 1791. By that Act the company was empowered and directed to make bridges to carry certain highways over their canal, and sec. 61 provided that all such bridges should "from time to time be supported, maintained, and kept in sufficient repair by the company." The substantial question in the case was whether these words imposed any obligation on the company to reconstruct the bridges so as to make them capable of bearing modern heavy motor traffic, and it was held that they were not under this obligation, but were only liable to keep in repair the particular bridges, the size and strength of which were originally determined by commissioners appointed under the Act. It may be that the contention of the railway company in the present case is based upon increased traffic over the approaches, and we can only repeat what we said before that their liability may have to be determined by the provisions of the Special Act of Parliament under which the railway was constructed.

Rural District Councils Association.—Delegates from over 130 authorities were present at the annual meeting of the Rural District Councils Association, held on Wednesday at the City of London Guildhall. The report stated that the association now includes 155 rural district councils out of a total of 650.

Loans to Local Authorities.—On Wednesday, in the House of Commons, Mr. Montagu, Financial Secretary to the Treasury, stated that at the present time loans were only granted by the Public Works Loan Commissioners when it could be shown that their purpose was urgently necessary in the national interests for the furtherance of the war, or was of urgent necessity for reasons of public health. This arrangement had been made in pursuance of the Government's general policy of postponing or avoiding all new capital expenditure wherever possible. New loans were therefore only granted in respect of works for which a local authority was able to produce evidence of Treasury or Local Government Board approval granted since the special restrictions out of the needs of the war had been effective. In cases where loans had already been granted, but either had not yet been advanced or had been partly advanced, the Public Works Loans Commissioners required that all possible efforts must be made by the local authority concerned to postpone or delay expenditure in connection with the loan, and advances were not made out of the loan unless it could be shown that those efforts had been made. The total amount of new loans granted from April 1 to June 7, 1915, was £27,454, as compared with £809,649 during the corresponding period of 1914. The total amount advanced was £419,271, as compared with the £710,445 for the corresponding period of 1914. This amount represented, for the most part, advances in respect of loans which had been granted prior to the new restrictions.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Colwyn Bay U.D.C. (June 3rd. Mr. W. O. E. Meade-King). £660 for the purchase of a high-level estate on the border of the district on which it is proposed to construct a surface reservoir.—This is to contain 11,000,000 gallons of water, sufficient to meet the requirements of the district in the event of any fracture of the main until the repairs are effected. Mr. J. H. Roberts, deputy clerk, and Mr. W. Jones, engineer, gave evidence.

Conway and Colwyn Bay Water Supply Board (June 3rd. Mr. W. O. E. Meade-King).—£6,000 for the construction of a girder bridge over the river Conway, near Dolgarrog, for the purpose of carrying the 15-in. water main which now passes under the river.—It was pointed out that, as the main under the river is liable to damage in the event of floods, and is then difficult to get at, the bridge is urgently required. Colwyn Bay's summer population was estimated at 30,000, and it would not be proper that the water supply should be in any way liable to interruption.

Market Harborough R.D.C. (June 1st. Mr. W. Shelford Bidwell).—This was an inquiry into a complaint by certain ratepayers that the council had been in default in failing to provide a water supply for Fleckney.—In the course of the proceedings Mr. H. G. Coales, the engineer and surveyor, explained a scheme which he has prepared, and which, he said, would, from a source at Mowsley, supply four villages with water. The cost for Fleckney alone would amount to £3,700, and, if carried out for the four villages, he estimated the cost at £7,000—£3,000 for Fleckney and £4,000 for the Kibworths and Smeeton. On behalf of the council it was stated that it was thought desirable to postpone the scheme until after the war.

APPLICATIONS FOR LOANS.

Birkenhead T.C.—£68,500 for building 200 workmen's houses.

Godalming T.C.—£2,830 for two boreholes and other works of water supply.

Kidderminster T.C.—£5,000 for the sewering of the added areas in the extended borough.

Skelmersdale U.D.C.—£2,000 for improvements to the gasworks.

Watford U.D.C.—£2,208 for private street works.

LOANS SANCTIONED.

Batley T.C.—£3,391 for electric cable extensions.

Bispham U.D.C.—£3,586 for electric lighting.

Bournemouth T.C.—£510 (for sixty years) and £831 (for twenty years) for the widening and improvement of St. Stephen's-road.

Colchester T.C.—£3,434 for hospital extension and road making.

Dover T.C.—£1,000 for new electricity services.

Enniscorthy R.D.C.—£3,000 for a housing scheme.

Evesham Joint Hospital Board.—£1,000 for extensions at the hospital.

Exeter T.C.—£541 for road widening.

Gower R.D.C. £420 for road diversion.

Nantyglo and Blaina U.D.C.—£557 for the purchase of land for a public improvement.

Porthcawl U.D.C. £8,000 for a new water main.

Portrush U.D.C.—£650 for a water supply to the added area.

Rotherham T.C.—£8,400 for the purchase of water-tube boilers for the generating station.

Watford U.D.C.—£26,000 for the purpose of the waterworks.

FORTHCOMING INQUIRIES.

JUNE.

		£
15.	**Barrowford.** For works of private street improvement (Mr. W. O. E. Meade-King)	2,200
15.—	**Pembroke.** For works of sewerage (Mr. F. H. Tulloch)	4,000
15.—	**Rugby.** For works of sewage disposal (Mr. A. W. Brightmore)...	1,000
17.—	**Newport (Mon.).** For the purposes of road widening (Mr. F. H. Tulloch) ...	950
17.—	**Wrexham.** For the erection of houses (Mr. W. O. E. Meade-King)	6,056
18.—	**Ellesmere Port.** For the erection of council offices (Mr. W. O. E. Meade-King)	5,500

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Was not the discussion on pressure filters at Shrewsbury a little disappointing, inasmuch, with one exception, all the speakers were evidently so favourably impressed with mechanical filtration as against ordinary gravity filtration, that there was really very little discussion? Can there be any doubt, however, that under certain circumstances, even if mechanical filtration is more expensive than ordinary sand-bed filtration, the mechanical filter has so greatly improved that it can be relied on to remove organic impurity when a coagulant is added to the water?

* * * *

Is it not rather to be regretted that the Institution of Municipal and County Engineers have decided to include a dinner at their annual meeting this year when so many other institutions have decided not to have any social gatherings during the war? Would it not have been more in accord with the general feeling of the community if the dinner had not been held under the present conditions?

* * * *

Why is it that the roads in and around Oxford are in such a deplorable condition? Why is it that, although nearly everyone is complaining of these roads, nothing is done to reconstruct them on modern lines?

* * * *

Is it a fact that there is a certain town in Hampshire in which the council have practically made it impossible for their surveyor to go to the Front, as they decline to keep his place open for him or to assist his family in any way? Is it not almost inconceivable that even now there are a vast number of men in this country who do not yet realise the extreme gravity of the present crisis?

* * * *

Would not Cabinet Ministers be better able to manage the affairs of the nation at this critical period if they were not hampered by sittings of "the House"? Cannot surveyors sympathise with them sometimes when, engaged in very important executive work, they have to attend a meeting of their council?

* * * *

Should not all surveyors and engineers who are troubled with settlements in buildings or roads due to mining or other causes go to Northwich and study the question? Is it not a fact that at this town and its neighbourhood one may see splendid examples of underpinning, and of scientific "needling" of buildings which have sunk in a most alarming manner? Why is it that one never hears of terrible accidents from the collapse of buildings in a place where the soil appears to be ever on the move?

* * * *

With regard to subsidences caused by mining, or other causes beyond the control of a local authority, is it a fact that the Local Government Board specially allow the use of a plastic clay for jointing stoneware pipes for sewer or drain purposes? Are there not also numerous flexible joints which can be used which will prevent breakage of joints or pipes where ground has subsided after the sewers or drains have been laid?

* * * *

Would not the question of how to prevent the breeding of flies be largely met if at country houses and public institutions there were installed one of the convenient and cheap "Domestic" refuse destructors now being made in large quantities by the New Destructor Company, Limited, at Pershore? Is it not an established fact that flies are active carriers of disease, and that the only safeguard is to prevent their birth by destroying their breeding-places? Why is it that, when there is so simple a remedy at hand, it is not universally used?

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below:—Buildings: Birkenhead, East Suffolk, Manchester, Market Harborough, Swansea and Town Planning: Birkenhead, Market Harborough, Wrexham, York and Refuse Collection and Disposal: Cardiff, Dover. Roads and Materials: Ardsley, Barking, Stalbridge, Swansea and Sewage Disposal: Ilford, Water, Gas and Electricity: Dublin. Particulars of other projected works will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Birkenhead T.C. The Local Government Board have given their sanction to the erection of the Dingwall sanatorium being proceeded with and a tender at £7,793, has been accepted for the work.

Blackpool T.C. The council have come to an arrangement with the War Office to convert the Central Pier grand stand and concert room into a convalescent home for wounded soldiers.

Bognor U.D.C. — Answering a complaint by a councillor that the expenditure in connection with the East End public conveniences had exceeded the estimate by £216, the surveyor, Mr. O. A. Bridges, stated that building an underground lavatory was not like building a house. When he made the hole in the ground he felt like giving the whole job up. When he put in concrete it all went out of sight. The job worried him more than any other he had had to carry out. If work was carried out at a lower cost than the estimates, nothing was said about it. He gave an instance where on one occasion, by doing work himself, the cost was £1,500 below the lowest tender, while he also saved £600 in the building of the workmen's cottages. The lavatory job was a most difficult one, and he had to pay an enormous price for bricks.

Bootle T.C.—A scheme has been approved for alterations at the municipal offices, at an estimated cost of £400.

Crewe T.C. It has been agreed to erect 30 cottages at the sewage disposal works.

Canterbury T.C.—It has been decided to carry out alterations at the assistant medical officer's quarters at the asylum, at an estimated cost of £300.

Chard T.C.—A scheme has been adopted for the improvement of the Corn Exchange, including repairs to the roof.

Dublin T.C.—There is stated to be serious unemployment in Dublin, and in consequence of this the Housing Committee, in asking the council to take steps to press the claims of Dublin for the benefits of the Housing Act of last year, say the necessity for providing the financial aid proposed by the Act is extremely urgent, as unless assistance is vouchsafed from this source all further building work by the corporation must be suspended. This would be most lamentable in view of the pressing need of dealing with the housing in Dublin, as shown by the findings of the Local Government Board Departmental Committee, as well as the provision of employment in the building trade, the dearth of which, owing to the war, is clearly demonstrated.

East Suffolk C.C.—It is intended to build an isolation hospital, at an estimated cost of £6,000.

Llanelly T.C.—The Local Government Board have written sanctioning a Provisional Order to unite the borough of Llanelly, the urban district of Burry Port, and the rural district of Llanelly into a united district for hospital purposes. It was now too late, it was stated, to introduce a Provisional Order with a view to confirmation in the present session of Parliament, and the board therefore suggested that the three authorities should confer with a view of carrying out the proposed scheme by agreement. The town council on Tuesday last agreed to this suggestion.

Manchester T.C.—A modified scheme has been prepared for the extension of the meat market and abattoirs in Water-street. The estimated cost is £10,000.

Midlothian C.C.—It has been decided to provide on the sanatorium site a pavilion to contain twelve beds. The estimated cost is £3,000.

Nottingham T.C.—A report has been submitted by the Baths Committee on proposals to build baths in several parts of the town.

Swansea T.C.—It is intended to convert premises in Mansel-street into a school clinic, at a cost of £1,360.

HOUSING AND TOWN PLANNING.

Birkenhead T.C.—The council propose to make application to the Local Government Board for sanction to borrow £68,500, the estimated cost for erecting 299 dwellings in the Gilbrook estate, at the north end of the town. It is not expected, however, that building will actually be commenced until after the war. According to a report published recently, the buildings will be of four types, as follows: Type A (small), comprising ten blocks of sixty-four self-contained dwellings, with an average frontage of 16 ft. and a depth of 36 ft. Each house will have a living-room, scullery (with boiler), bath-room (separate), and food store on the ground floor, and three bedrooms on the first floor. Type A (large), comprising seven blocks of forty houses, will be a larger house after the style of Type A (small), the dwellings having an average frontage of 17 ft. 6 in. Type B, comprising ten blocks of sixty houses, will also be on the lines of Type A, and will contain an extra room on the ground floor—namely, a parlour with a bay window. These houses will face Brassey-street, Norman-street, and Lansdowne-road, and an alternative plan will be carried out with the bath-room on the upper floor in certain houses. Type C will comprise seven blocks of flats, containing 120 separate dwellings. Two blocks of the flats will face playgrounds, and will contain twelve three-room houses, consisting of living-room, two bedrooms, and scullery; and six two-room ones, with living-room, bedroom and scullery. Four other blocks will contain six three-room, six two-room, and six one-room flats; while one block will provide twelve three-room dwellings. All the houses in the flats will be entered from balconies reached by a central stone staircase.

Market Harborough U.D.C.—It has been decided to take the necessary steps for the preparation of a town planning scheme.

Mirfield U.D.C.—A site has been secured in Nettleton-road for the purpose of a housing scheme.

Wrexham R.D.C.—The council have received authority to prepare a town planning scheme.

York T.C.—The sanction of the Local Government Board has been obtained to the preparation of a town planning scheme in respect to three areas, and the city engineer, Mr. F. W. Spurr, has received instructions to take steps in connection with the competition for the prize offered by the late Dr. Tempest Anderson, and other prizes offered by the Streets and Buildings Committee, for the best scheme, with observations on the remaining areas in and around the city of York.

REFUSE COLLECTION AND DISPOSAL.

Cardiff T.C.—It has been decided to purchase 60 acres of land, at £5 per acre, and 47 acres at £1 per acre, on the East Moors for the purpose of a tip. Negotiations are in progress for the purchase of more land on an adjoining site.

Dover T.C.—With respect to the disposal of refuse the medical officer of health urged strongly that a refuse destructor should be utilised, and he pointed out the importance of destroying material which was the breeding-ground for rats, flies, and gnats. He understood that the deputy surveyor was in favour of one. The council decided to refer the consideration of the matter to a committee.

ROADS AND MATERIALS.

Ardsley U.D.C.—The surveyor, Mr. John Morley, has received instructions to report upon the best means of improving Grange-lane.

Barking U.D.C.—A resolution has been adopted that, in the case of future private street works, the charges be made repayable by half-yearly instalments, to be spread over a period of five years from the date of demand, with interest at 5 per cent per annum, provided that any owner shall have the option of paying the full amount of the apportionment within six months of the date of demand.

Cork T.C.—The Public Works Committee have been authorised to incur an expenditure of £500 on the concreting of footpaths.

Doncaster T.C.—An important street improvement is contemplated at the junction of St. Sepulchregate and West Laithgate.

Golcar U.D.C.—Repairs, estimated to cost £891, are to be carried out in several roads.

Hampton Wick U.D.C.—The surveyor, Mr. P. Taylor, was on Monday authorised to purchase 4,000 wood blocks for repairs to the High-street and Upper Teddington-road.

Henley-on-Thames R.D.C.—It was decided on Tuesday to suspend all road-repairing work during July and August to release the council's employees for harvest work.

Kidsgrove U.D.C.—Road repairs, including tar-spraying, are to be carried out at a cost of £1,000.

Leeds T.C.—It has been agreed to carry out the widening of Nippet-lane, at a cost of £1,458, including £1,220 for the purchase of land.

Mutford (East Suffolk) R.D.C.—Tarring is to be carried out on certain roads at an estimated cost of £274.

Newry No. 2 R.D.C.—It was reported that only two of eleven ordinary road maintenance proposals and only three of twenty special works were tendered for. The clerk said he assumed that the scarcity of contractors was due to the difficulty of getting labourers at the present time, and to the fact that, as the farmers were getting such good prices for their produce, they did not care about going in for road works. The county surveyor, Mr. R. H. Dorman, said that most of the works were necessary. If they were given into his hands he could not guarantee to carry them out, as he might not be able to get labour, but he would do his best. The council approved of the arrangements proposed by the county surveyor for the provision of materials, horse work, and tools in respect of the second and third class roads in the direct labour scheme for the current year.

Perthshire C.C.—A letter has been received from the Road Board by the Highland District Committee on the subject of limiting expenditure on roads to necessary work in view of national economy, expenditure at the same time being sanctioned for tar-spraying the surfaces of certain roads. With regard to outlays on experimental sections of roads, arranged in conjunction with the Road Board, and now abandoned, the Local Government Board intimated that the cost of all instruments would be refunded, together with 75 per cent of the cost of materials.

Rotherham T.C.—Sanction has been received from the Treasury for the borrowing of £1,000 in order to complete the works in Corporation-street.

St. Germans R.D.C.—The assistant county surveyor, Mr. H. A. Hosking, wrote suggesting a reconsideration of the council's decision not to employ a stone crusher in Heskyn quarry, pointing out that with the present scarcity of manual labour it would be impossible not only to carry out the council's contract to supply the county with 1,300 yds. of stone, but their own requirements of 1,000 yds. as well. If the council still declined to take advantage of a crusher some strong line of action must be taken by the county authority. The chairman, Mr. K. G. Foster, suggested they should hire the crusher themselves without any interference whatever from the county council, and a resolution to that effect was adopted.

Stirlingshire C.C.—A scheme has been prepared by the Western District Committee for the improvement of the Glasgow-Aberfoyle road.

Staffs C.C.—The road estimates approved by the council include an additional expenditure of £3,000 on Tarvia, £1,800 more on ordinary maintenance, and £250 on tar-spraying. The Treasury have promised the council a grant of £10,500 through the Road Board. At the meeting of the county council recently Mr. Newton also called attention to the excellent annual report of the county surveyor. There were two paragraphs in it to which he would like to call their attention. They would see that they were expending a considerable amount of money on roads in the Walsall and Birmingham district from which they reaped little or no benefit, and he would like to know how they could recoup themselves for this expenditure. Could it be done by increasing the taxation on the heavy vehicles, particularly motor 'buses, which had come into existence so recently, and were doing more damage to the roads than any other vehicles travelling upon them? People who owned big motor vehicles would come from Coventry to fetch a 2-cwt. load, and they had the roads kept in order for nothing. They were swindling the railway companies. Mr. Brown said that in a Birmingham newspaper recently there was an advertisement of a firm whose lorries went to Manchester every day, and they were offering to bring back goods from Manchester at the same rates the railways charged. It was grossly unfair that these people should not pay to the rates, while railway companies had to pay for every inch of permanent way.

Torquay T.C.—A grant of £150 has been received from the county council towards the cost of tar-spraying the main roads.

Winchester T.C.—The scheme for widening Bridge-street has been advanced a step by the purchase of property at a cost of £900.

SEWERAGE AND SEWAGE DISPOSAL.

Blackburn R.D.C.—It has been agreed to carry out improvements at the sewage disposal works, at an estimated cost of £350.

Brownhills U.D.C.—The surveyor, Mr. J. H. Shaw, has been asked to prepare a scheme for laying a new sewer above the Hall-lane sewer.

Durham T.C.—Plans have been prepared by the city surveyor, Mr. J. T. Pegge, for a new sewer from South-street to Margery-lane, and the county council have agreed to construct a sewer from Wanless-terrace along St. Nicholas' cemetery, to within 100 ft. of a proposed new street.

Isle of Wight R.D.C.—The council are conferring with the Shanklin Urban District Council on the subject of the Chillerton sewerage scheme.

Radstock U.D.C.—The surveyor, Mr. G. H. Gibson, reported recently that on just over 2 acres of sewage land they last year grew 81 tons 17 cwt. of wurzel, which was sold for £42 19s. 6d. Additional small crops realised £3 5s., making a total of £46 4s. 6d. The cost for manual labour was £20 17s. 2d.; horse hire, £3 10s.; seeds, 19s. 11d.; advertising, 10s. 6d.; total, £24 17s. 7d.

Truro T.C.—A letter has been received from the Local Government Board stating that they were unable to sanction a loan for £24,300 for the carrying out of the scheme for sewerage and sewage disposal at the present time, but the corporation should proceed with the negotiations for a lease of the lands required for the purposes of the scheme.

WATER, GAS, AND ELECTRICITY.

Bourne R.D.C.—The Sanitary Committee, having considered the draft agreement for the purchase of the existing water supply at Castle Bytham, recommended a slight alteration to one of the clauses, and the council directed that it should be sent to the parish council to consider.

Coleraine U.D.C.—The council have approved a proposal of the Improvement Committee, in connection with the construction of a new service tank at Ballyvassal reservoir, that the engineers of the scheme be paid at the rate of 4 per cent on the amount of the contract.

Cowdenbeath T.C.—Some time ago the council negotiated with the District Committee of the county council for a supply of water from Loch Glow, and came to an understanding that, when times permitted, the town would be assured of 162,000 gallons per day, involving a capital expenditure of, approximately, £13,000. Owing, however, to unforeseen circumstances, the Admiralty and the District Committee are unable to grant this, and it has been decided to revert to the Dalbeath Pit water.

Driffield R.D.C.—A Local Government inquiry was held recently into a proposal to apply for £180 for the purpose of providing a water supply for the village of Foston. Mr. Brightmore, the Local Government Board inspector, has reported favourably on the scheme, which was prepared by Messrs. Fairbank & Son, of York, and the council decided recently to instruct the engineers to proceed with the matter, and to invite tenders for the work.

Dublin T.C.—The council on Monday last authorised the borrowing of £34,842 for the purposes of waterworks.

Heanor U.D.C.—Replying to a question with respect to the new water-softening process now being tried

experimentally by the Ilkeston and Heanor Water Board. Mr. Andrews stated that the board had a report from the engineer which showed that the portion of water treated by the new filter was considerably improved. The total of filters required to treat the whole of the water would be from twelve to twenty. Whether the scheme could be made financially workable was not yet decided, the experiment not being complete or a final result obtained. He wished to make it clear that the experiment was being made at the expense of the inventors of the system, and not of the board, and that the company would in case of rejection take out their plant at their own expense.

Howden R.D.C.—A letter has been received from the Local Government Board stating that the board considered that the preparations of the Howden water supply scheme should be proceeded with, in order that the work might be put in hand when more favourable conditions prevailed. Colonel Saltmarshe said that there were obvious reasons for not going on with the scheme during the war, and the Local Government Board had apparently accepted those reasons. As regarded the preparation of the scheme, if it was assumed that the war would last two years, the conditions in the district would be likely to vary in that time. A scheme for bringing water towards the western area of the council's district—namely, from the Selby side across the bed of the river Ouse to a part of the Riccall Rural District—was to be carried out, and it was quite possible that the facilities offered by this scheme might induce the Howden Council to vary their scheme. It was decided to explain these facts to the Local Government Board.

Knaresborough U.D.C.—The council on Monday decided to increase the price of gas by 3d. per 1,000 ft., and to allow the usual £250 from the profits for the relief of the district rates.

Middlesbrough T.C.—The Local Government Board have sanctioned a loan to cover the expenditure for laying electricity mains to works engaged on making munitions of war.

Nottingham T.C.—Dealing with the annual report of the Water Committee, Alderman Hunstman stated at the council meeting on Monday that there was a movement on foot to improve the water, the supply of which was cut off some time ago because of the disastrous effects on iron pipes. The committee could not look on that state of things with satisfaction. Scientific investigations were made, and they were satisfied that without any kind of doctoring the water could by a certain process, purely natural, be made suitable for consumption and use. That method they had decided to adopt. The particular needs of local industries were considered, and it had occurred to them that they might make the water conform to their peculiar needs. In a general scheme that could not be done, and Nottingham had therefore decided to spend money in the work of suitable plant for the treatment of their own supply. He believed that it would then be found in all respects satisfactory, and would be an exceedingly important part of their supply.

Penrith R.D.C.—A scheme, estimated to cost £470, has been prepared for obtaining a water supply for the north-east part of Skelton.

Taunton T.C.—The electricity undertaking last financial year showed a loss of about £600, and the council have decided to advance by 10 per cent. the prices of current used for lighting purposes.

MISCELLANEOUS.

Barking U.D.C.—The council have approved a recommendation of the Town Planning Committee that the necessary steps be taken to establish a municipal market or markets in Barking; also that the surveyor, Mr. C. F. Dawson, submit a report to the next meeting of the committee upon the most suitable site for markets in the town, and the probable cost.

Carnarvon T.C.—With reference to the cemetery, which is in course of being laid out, the accountant reported that the expenditure so far amounted to £1,980, towards which the council had borrowing powers for £1,880. For a further expenditure of about £150 it was estimated that the cemetery could be brought to a state where it might be left for some time, and it was therefore decided to ask the Local Government Board to sanction the borrowing of a further sum of £250 to cover the excess expenditure.

Chelmsford T.C.—In view of possible enemy air raids the strength of the fire brigade has been augmented by the appointment of fifteen volunteer firemen, and the borough engineer, Mr. P. T. Harrison, has been authorised to purchase 500 ft. of hose and necessary couplings, two stand-posts and four branches, one hand truck, twelve belts and axes, and fifteen armlets, the estimated cost being £60. Arrangements had been made for the volunteer firemen to be called upon any outbreak of fire occurring through an air raid.

Salford T.C.—It was reported to the Watch Committee on Monday that there was no further need for the use of horses for fire brigade work in the borough. For some time the committee has been purchasing the chassis of motor-cars, which have been completely overhauled by members of the brigade, and have been connected with fire engines and ambulances.

Twickenham U.D.C.—On Saturday the new motor [illegible], which has been supplied by Messrs. Dennis Brothers, of Guildford, at a contract price of £1,125, was officially and most satisfactorily tested. The engine is of 60-h.p., and capable of travelling at a rate up to 20 miles per hour on the level, and 12 miles per hour on a gradient of 1 in 7. The main pump, which is of the multi-stage turbine type, is driven by the road propelling engines, and is designed to throw 450 gallons of water at 120 lb. per square inch per minute. A 50-ft. sliding carriage escape is carried on the [illegible] which can be used as a water tower, and [illegible] can be extended to 60 ft. by means of the first floor ladder. Accommodation is provided [illegible] complement of fire gear and twelve men, and the machine is also fitted with a portable acetylene searchlight for lighting the road or throwing a searchlight upon any portion of a building.—Permission has been received from the Port of London Authority to moor a barge at Marble Hill for the purpose of a bathing station, and the council have accepted the tender of Messrs. John Selbourne & Co., at £37, for providing and driving the necessary piles for mooring [illegible].

PERSONAL.

Mr. [illegible] Mackenzie, surveyor to the Llanrwst Urban District Council, has resigned.

Mr. Thomas McAuliffe has been appointed surveyor to the Llanrwst Urban District Council.

Mr. Charles Horobin, acting engineer, has been appointed waterworks engineer to the Lincoln Corporation at a salary of £250 a year.

Mr. H. Blewitt, surveyor to the Mutford (East Suffolk) Rural District Council, has had his salary increased from £125 to £140 a year.

Mr. J. Rowbottom, deputy borough engineer of Ashton-under-Lyne, has received an honorarium of £100 for special services as engineer for the reconstruction [illegible] special works.

Major Henry Macaulay, formerly borough engineer and architect to the Kingston (Surrey) Corporation, is to be congratulated on retaining excellent health, [illegible] on Thursday of last week he reached the age of eighty-five.

Mr. Archibald Wilson, county road surveyor of Dumbartonshire since 1868, has been appointed advising surveyor and consulting engineer to the council; Mr. James Andrew, assistant to Mr. Wilson, has been appointed county road surveyor; and Mr. Peter Miller has been promoted to the position of assistant road surveyor.

Mr. Cyril B. Henry, son of Mr. T. Henry, surveyor to the East Retford Rural District Council, has passed his final examination as a Licentiate in Dental Surgery of the Royal College of Surgeons, England. Mr. Cyril Henry, who is only twenty-one years of age, has now been appointed house surgeon at the Royal Dental Hospital, London. He won the "Saunders" scholarship, which is considered the blue ribbon of the Royal Dental Hospital, and other prizes. Mr. F. Allen Henry, second son of Mr. Thomas Henry, has been appointed midshipman, R.N.R., on H.M.S. "New Zealand," and has joined his ship. The "New Zealand" is a battle cruiser of 18,800 tons, and was built at the charge of the New Zealand Government.

Columbia University has appointed the following non-resident lecturers for the 1915-16 session of the Graduate Course in Highway Engineering: Messrs. Charles J. Bennett, State Highway Commissioner of Connecticut; John A. Bensel, consulting engineer;

Will P. Blair, secretary, National Paving Brick Manufacturers' Association; Sumner R. Church, manager, research department, Barrett Manufacturing Company; Frederick A. Cleveland, director, Bureau of Municipal Research, New York; William H. Connell, chief, Bureau of Highways and Street Cleaning, Philadelphia; Morris Llewellyn Cooke, director, Department of Public Works, Philadelphia; W. W. Crosby, chief engineer, Maryland Geological and Economic Survey and consulting engineer; Charles Henry Davis, president, National Highways Association; A. W. Dow, chemical and consulting paving engineer; Edwin Duffey, Commissioner of Highways, New York State; Lewis R. Ferguson, assistant secretary, Association of American Portland Cement Manufacturers; C. N. Forrest, chief chemist, the Barber Asphalt Paving Company; Wilson P. Foss, senr., president, the New York Trap Rock Company; Walter H. Fulweiler, chief chemist, the United Gas Improvement Company; E. P. Goodrich, consulting engineer; D. L. Hough, president, the Cuban Engineering and Contracting Company; William A. Howell, engineer of streets and highways, Newark; Nelson P. Lewis, chief engineer, Board of Estimate and Apportionment, New York; Walter R. Marden, vice-president and chief engineer, the United Construction Company; H. B. Pullar, general manager, the Pioneer Asphalt Company; Philip P. Sharples, manager, general Tarvia department, Barrett Manufacturing Company; Francis P. Smith, chemical and consulting paving engineer; Albert Somner, consulting chemical engineer; George W. Tillson, consulting engineer to the President of the Borough of Brooklyn, New York; John Cassan Wait, attorney-at-law; George C. Warren, president, Warren Brothers Company.

OBITUARY.

Mr. R. W. Smith Saville, borough engineer and surveyor of Darwen, died, we regret to state, on the 2nd inst., after an illness of two months. Mr. Saville proceeded to Darwen from Burton-on-Trent in September, 1896, when he was appointed successor to Mr. W. Stubbs. During the time he held the appointment he carried through many important schemes, including the electrification of the tramways and the laying of the tramway to Hoddleston. He was also responsible for the new sewage works, the electricity works and destructor, the laying out of Sunnyhurst Wood, the improvement of Belgrave-square, and the erection of new schools at Sudellside and Springbank. He was officially concerned in the taking over of a supply of water from the Bolton Corporation. The *Darwen News*, in a eulogium of Mr. Saville, says: "In his work, whether pertaining to architecture or to general construction, he exhibited great taste and ability in design, and perhaps the one pity was that Darwen was not sufficiently large to give full scope to his ideas and ability. His ideals were very lofty, and the greater and more important the work the more agreeable to Mr. Saville, and had he been in charge of a larger borough, with greater financial opportunities, the very best would have been brought out of him. His energy and enthusiasm were unlimited, and whatever object claimed his attention he entered into it with a zeal possessed by few people. His organising powers were great."

Stream Pollution from Gas-tar.—An application in the High Courts has been granted restraining the Ashbourne Rural District Council from polluting the river Henmore with gas-tar from their gasworks.

New Bowling Greens at Todmorden.—Two new bowling greens which have been constructed by the Todmorden Corporation in Centre Vale Park, were formally opened on Tuesday. The cost (including pavilion and shelter) was about £100.

Thames Conservancy: Proposed New Lock at Molesey. In April last a breach was caused in the island between the lock cut and the weir stream at Molesey, and it was agreed to repair it at a cost of £660. On Monday there was considered a proposal of the engineer that in lieu of repairing the breach a small lock be constructed on the site which has been scoured out. The existing lock is 267 ft. by 30 ft., the proposed additional one would be 60 ft. by 10 ft., and its estimated cost, with wing walls and protective work, £2,000. It was agreed to abandon the scheme unless the Metropolitan Water Board—who, it was stated, lost 250,000 gallons of water every time the big lock was used—would agree to pay half of the full cost.

CORRESPONDENCE.

Ἐκ ἀνὴρ οὐ πάντ' ὀρᾷ
(One man does not see everything.)
EURIPIDES.

HOUSEHOLDERS AND FIRES DUE TO AIR RAIDS.

To the Editor of THE SURVEYOR.

SIR,—Since the issue of the British Fire Prevention Committee's "Warnings" as to the character of the fires resulting from air raids, and the best means of dealing with them, many hundreds of householders have addressed themselves to this office as to whether they would be well advised to expend money on certain classes of proprietary or patented minor chemical fire appliances.

The committee has thus deemed it to be in the public interest to make the following announcement supplemental to their previous "warnings," more particularly as householders, in their anxiety to protect their premises, are frequently induced to obtain entirely unsuitable and unreliable apparatus in lieu of the more simple and economical appliances on which they can depend:—

(*a*) Ordinary domestic buildings, shops and offices should have an ample supply of buckets (kept ready filled with water), and, where funds permit, one or more small hand pumps. Occupants should know how to use these simple appliances efficiently.

(*b*) Pitchers and other minor household vessels should be kept filled ready for use, and where there are baths, wash-tubs, &c., these should be kept filled, so that a supply of water may be available independently of the water mains. Where there are garden utensils, such as syringes, garden pumps, &c., they should be readily accessible.

(*c*) On no account should money be expended on powder extinguishers (tubes), hand grenades (glass bottles or tubes), extinguishers and squirts containing carbon tetrachloride or similar chemicals which are liable to form noxious gases. Such appliances are unreliable or unsuitable.

(*d*) If portable liquid chemical fire extinguishers are desired, they should be of 2 or 3 gallons capacity, and a warranty should be obtained that they comply either with the specifications of the Board of Trade, H.M. Office of Works, the Metropolitan Police, or of this committee, these specifications being mainly intended to prevent accidents from bursting.

The public should remember that fires caused by incendiary bombs, if promptly tackled with water in fair bulk, force and continuity, need not spread, and are not quite the terrifying problem to deal with that the enemy would make them. It is mainly a matter of concentrating the available liquid fire appliances, and applying water energetically, so as to obtain the necessary cooling effect. The incendiary bombs so far used by the Germans do not, as a rule, contain petrol, but thermit, which, on combustion, takes the form of molten metal of high temperature, resultant fires having none of the characteristics of spirit fires, which latter require the use of sand.

In any event every effort should be made by the public to assist the fire brigades in their onerous duties; but they should not omit, on any account, immediately to notify any outbreak that comes to their notice by telephone or otherwise, the method of calling assistance to be posted up.

Those who desire additional useful hints on the fire question arising from possible air raids should apply for the British Fire Prevention Committee's "Warnings," which are provided gratuitously upon written application to the registrar at 8 Waterloo-place, Pall-mall, London, S.W. (enclosing large-size stamped and addressed envelope). These "Warnings" give useful information as to the necessary precautions, and how to act when the emergency arises.—Yours, &c.,

ELLIS MARSTAND,
General Hon. Secretary,
British Fire Prevention Committee.

8 Waterloo-place, S.W.
June 8, 1915.

New Ribble Bridge Opened.—The new county council bridge which has been erected over the river Ribble at Preston, at a cost of £40,000, and which incidentally shortens the distance between Preston and Liverpool by nearly two-thirds of a mile, was formally opened on Wednesday by Sir William Scott Barrett, chairman of the county council. The original bridge was built in 1750, and proved quite inadequate for present traffic.

The Fitting up and Working of a Sewage Works Laboratory.*

By JAMES H. EDMONDSON, F.C.S., Chemist and Manager of the Southall-Norwood Sewage Works.

Mr. Reginald Brown, M.INST.C.E., &c., the engineer to the council, has suggested to the author that a short paper on this subject might be of interest, especially as a large number of sewage works are under the control of members of the institution. The author has accepted the suggestion, although a large amount of literature has already been published on this matter, and much valuable information can be obtained on the question of standards and analysis by a perusal of the various reports of the Royal Commission on Sewage Disposal. Having been an assistant at the Manchester sewage works, the author's remarks on the various tests carried out, and the method- adopted in a sewage works laboratory—such as at Southall-Norwood—apply to those in which he has had practical experience—viz., those recommended by Dr. Fowler and used in the Manchester laboratory, as well as those recommended by the Royal Commission.

Fitting up a Laboratory.—In designing and fitting up a laboratory at a sewage works one is seldom able to go in for an elaborate building, neither is it necessary to do so. A laboratory should be useful before being ornamental. The essential points to be observed in the construction must not, however, be overlooked. These are—stability, good lighting, ventilation, comfort to the workers, and proper provision for the protection of the instruments and appliances used.

The question of the materials of which a laboratory should be constructed is one of £ s. d. and local circumstances. At Southall one could only afford a corrugated iron building, lined with matchboarding; but after inspection the members will, the author hopes, agree that the structure is suitable for its purpose. Bearing in mind the use to which a laboratory is put and the value of the expression of the results obtained, depending to a considerable degree upon the delicacy of the weighing instruments, it will be seen how necessary it is that the laboratory should be as free as possible from vibration. The constant passing of heavy goods trains along the Brentford Docks branch of the Great Western Railway causes a considerable tremor in the ground at the Southall-Norwood sewage works, and to minimise this the building has been erected on piers. This construction also protects the building from floods, which at intervals occur, owing to the raising of the water level of the canal. Good lighting is necessary, owing to the number of calorimetric operations carried out, and efficient ventilation, to get rid of the fumes arising from some of the tests. Comfort for the workers is by no means the least of the provisions to be made, as the chemist and his assistants are engaged a good many hours in the laboratory, and cold draughts and cold feet and limbs should be avoided as far as possible. The analytical balance being one of the most important instruments used, it is essentially necessary not only to protect it from vibration, but also from dust and chemical fumes, and it is usual in many laboratories to provide a special room for it. The general arrangements of the author's laboratory are shown in the plan below, by which it will be seen that the balance is kept in a small office, in which the author also keeps the records, &c.

As the laboratory contains dangerous chemicals and delicate apparatus, the general workmen and others are not permitted access to same, but remain in a lobby. The work-room is provided with the necessary benches and cupboards, tables and shelves for chemicals, &c. The fume cupboard shown is for the purpose of getting rid of objectionable and poisonous fumes generated by various tests, and is ventilated into the external air. It is a simple wooden construction, having an ordinary window sash for access to same. As a fair amount of bottle washing takes place a sink and water supply is provided, and the necessary gas jets and fittings are in use for heating purposes. Unfortunately, owing to the situation of the works, the water supply is not laid on from the town mains, and it was necessary to use well water, and although this water is very contaminated, it can be, and is, used for washing and condensing purposes. The cost of the laboratory building was £50, and the necessary chemicals, apparatus and fittings, £60.

* Paper presented at the meeting of the Eastern District of the Institution of Municipal and County Engineers held at Southall on Saturday last.

WORKING.

Sampling.—The author would emphasise the fact that if information of any real value is to be obtained, the taking of samples should have special care. Snap samples convey very little, except that the condition of the sewage or effluent at the particular moment at which the sample was taken. Obviously, to be of value, the samples should be taken continuously over every twenty-four hours, say at hourly intervals, and mixed together in proportion, according to the flow. At the author's works, as at many others, the varying flow of the sewage has to be gauged from experience, as there is no measuring or recording apparatus. Experience at any particular works will very soon give the manager or chemist a fairly accurate idea of the variations in the quantity to be dealt with. As the members of the institution are aware, there are several forms of recording apparatus on the market, and one of these would be useful where they could be conveniently fixed, as the varying volume can by its use be easily recognised. As to the commencement and termination of the daily period over which the samples are to be arranged, different works may have different times. A convenient period is from 6 a.m. to 6 a.m.; but, of course, the objection to any such period is that the sample at any particular hour, from, say, the tanks, does not represent the equivalent in the crude sewage; hence the average daily samples of the crude sewage do not altogether correspond with the average samples from other points of the process of purification. This is apparent from the chloride figures; but, the variations being small, the results can be compared with

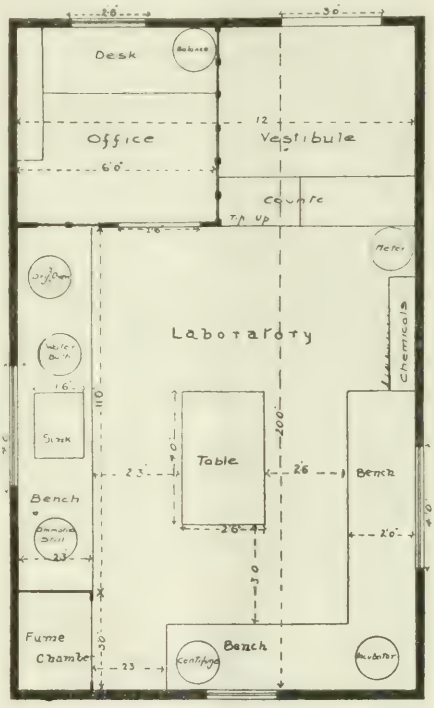


FIG. 1.

confidence, without any serious degree of inaccuracy creeping in.

TESTS.

The Royal Commission on Sewage Disposal has endeavoured to fix upon certain standards to which effluents from sewage works ought to conform, together with the methods of carrying out the various tests, all of which have no doubt been studied by the members of the institution, as they occur in the Eighth Report of the commission, together with the appendices. The only tests recommended by them are suspended solids and dissolved oxygen, but a large number of sewage works chemists carry out other tests, such as the four hours' oxygen absorption, chlorides, free and saline ammonia (ammoniacal nitrogen), albuminoid ammonia (albuminoid nitrogen), nitrites (nitrous nitrogen), nitrates (nitric nitrogen), three minutes oxygen absorption before and after incubation, and others, according to the sewage dealt with and the information required to be ascertained under particular circumstances. A few of these tests, along with their interpretation, will be briefly described.

Suspended Solids.—The importance of this test arises from the fact that the larger the amount of solids present in the final effluent the greater the pollution to the river into which it flows. The pollution caused by solids may be of two kinds—organic and mineral. With the former the discharge may give rise to nuisance, and the latter causes silting. The former is, of course, of the greatest moment, and the final effluent should therefore contain as little suspended solids as possible. The Royal Commission agreed that the degree of the treatment of sewage should depend somewhat on the nature of the stream, and suggested a certain standard for suspended solids, but not a hard-and-fast rule to be applied in all cases. The standard suggested is, "That the effluent shall not contain more than 3 parts of suspended solids per 100,000." In the laboratory the test may be carried out by means of a "Centrifuge," in which the solids from a measured quantity of liquid are extracted by the process of "whirling," the solids being afterwards placed in a weighed crucible, and the water evaporated off on a water bath, and afterwards dried in an air oven at 105 deg. Cent. The difference in weight between the weighed crucible and the combined weight of the crucible and dried solids gives the total amount of suspended solids in the quantity of the sample taken. As these solids are both organic and mineral, the amount of each can be ascertained by ignition at red heat, which destroys the organic and volatile matter.

The standard suggested by the commission is rather a stringent one, especially during the spring, when the sewage works is troubled with the spring outflush of solids, and even with a humus tank the standard is a difficult one to attain.

The Dissolved Oxygen Test.—For a full explanation of this (together with the last described) the author would refer the members to the Eighth Report of the Royal Commission.

It is considered the best test to give a real idea of what would take place in any stream by reason of the discharge of the particular effluent tested, inasmuch as the amount of oxygen can be approximately estimated that the particular sample under examination will absorb from the stream. This, coupled with the volume of such effluent or sewage, along with the quality and quantity of the stream into which it is discharged, gives a fair index of any possible pollution. Should the sewage effluent absorb all the oxygen from the stream, putrefaction will be set up by that portion of the organic matter in the sewage effluent which is unoxidised, causing a pollution in the lower reaches of the waterway. After much experimenting the Royal Commission have suggested a general standard, "that an effluent should not absorb more than 2 parts of oxygen per 100,000 from aërated tap water in five days, at 65 deg. Fahr., such standard to be movable according to local conditions." Neglecting the question of suspended solids, this standard is no more stringent than those adopted by the various watersheds and county councils; in fact, with a well nitrified effluent, the suggested standard is less stringent. But with a diluted tank effluent—which would pass the present standards—it would prove more stringent, and would in all probability fail it.

Four Hours' Oxygen Absorption Test.—This is the chief test carried out on most sewage works, owing to the ease with which it can be estimated. Although the test measures to a considerable degree of accuracy the amount of putrescible organic matter in a polluted liquid, it must not be forgotten that, as the results are affected by the presence of certain trade wastes the interpretation of such results must depend upon the knowledge possessed by the interpreter of the sewage under examination. The estimation of the quantity of the oxygen absorbed is carried out as follows: Two stoppered bottles are taken, and a measured quantity of diluted sulphuric acid, and also a solution of potassium permanganate of known strength is added. One of these bottles is kept as a blank, and the other used for testing the sample. In the latter is placed a quantity of liquid under examination, the quantity depending upon the amount of organic matter therein—*e.g.*, a larger quantity of liquid of greater purity being required than one of a lesser degree of purity—and both bottles allowed to stand in an incubator for four hours, kept at the standard temperature of 27 deg. Cent. In many cases there is no incubator provided; hence the liquids have to be exposed to the temperature of the laboratory. At the expiration of the four hours potassium iodide solution is added, and afterwards titrated against a standard (N/40) solution of sodium thiosulphate (1 c.c. is equivalent to ·2 mgm. of oxygen) until a faint straw colour is obtained, when a small quantity of starch solution is added. This gives a deep blue colour, which is carefully dispelled by the further addition of the standard sodium thiosulphate solution until the colour just disappears. As ·1 c.c. of the sodium thiosulphate solution is equivalent to ·2 mgm. of oxygen, the amount of oxygen absorbed can be estimated by a simple calculation. At the Southall-Norwood works an N/80 solution of potassium permanganate is used, whereas the Royal Commission recommend the use of N/8 solution; but the author has made several comparisons of the two solutions, and he is not alone in coming to the conclusion that the N/80 solution is far more delicate, and gives more consistent results.

This test has been adopted by a large number of watershed authorities, with the following classifications:

Below 0·71 part of oxygen absorbed per 100,000—good.
Between 0·71 and 1·43 parts of oxygen absorbed per 100,000—fair.
Between 1·43 and 2·14 parts of oxygen absorbed per 100,000—unsatisfactory.
Over 2·14 parts of oxygen absorbed per 100,000—bad.

In the classification of the strengths of crude sewages, the Royal Commission recommend the following:—

7 to 8 parts of oxygen absorbed per 100,000—weak.
10 to 12 parts of oxygen absorbed per 100,000—average.
17 to 25 parts of oxygen absorbed per 100,000—strong.

Chlorides.—By this test the amount of chlorides in terms of chlorine present in the sample may be ascertained. Its value, so far as sewage works are concerned, is in being able to compare not only the strength of domestic sewage, but also—owing to the fact that no degree of purification reduces the amount of chlorine—the final result with the crude sewage. To be quite accurate it is, of course, necessary that the chlorine figure in both should be the same, and unless this is so the liquids are not absolutely comparative. Although it is impossible in a sewage works to obtain a final effluent to compare exactly with any crude sewage at any particular moment, with care in sampling and a thorough knowledge of any particular works, any defect in the difference of the chlorine figure can be minimised to such a degree as to be quite accurate enough for all practical purposes. The test is also of considerable value in ascertaining the dilution of sewage in times of storm. The solutions required for this test are silver nitrate (1 c.c. being equivalent to 1 mgm. of Cl) and potassium chromate, and, if acid is present, ammonia can be used to overcome same before the test is applied.

From the particulars given in Mr. Brown's paper it will be seen that the chlorine figure at the author's works is very high, but this is entirely due to trade waste.

Free and Saline Ammonia (Ammoniacal Nitrogen).—The greater part of the nitrogen in sewage is present in the urea contained in the urine. This urea is rapidly converted into ammonium carbonate by ammoniacal fermentation, and in most cases such fermentation is practically complete by the time the sewage arrives at the works. In any case, after passage through the tanks there is little doubt that it is quite complete. Should the tank capacity be large in comparison to the flow of sewage, other fermentations will take place, such as the breaking down of the complex nitrogenous organic bodies into simple

[illegible] septic action is not required, it points to too great a [illegible] the tanks [illegible]

[illegible] and by [illegible] a measured quantity of [illegible] 50 c.c. of the sample, 2 c.c. of [illegible] of a 10 per cent. solution of sodium carbonate. Some of the water is boiled off to ensure that remaining [illegible] then added. The flask is connected to the condenser again and a further quantity boiled off, the distillate being collected in a graduated flask. The liquid remaining in the boiling flask is [illegible] mination of the albuminoid nitrogen (described later). The amount of ammon a is then estimated as nitrogen [illegible] proportion of the distillate, which has been Nesslerised against a standard solution of ammonium chloride.

The Nessler solution is prepared as recommended by Drs. Wilson and Calvert. It is extremely sensitive, and is a great saving of potassium iodide.

Albuminoid Ammonia (Nitrogen).—The majority of this nitrogen is that contained in the albumen and undigested portions of food contained in the fæcal matter, and, as already stated, it is [illegible] being [illegible] in the [illegible] tanks or bacterial filters into simple ammonia compounds.

The [illegible] of this estimation is that devised by Wanklyn, which depends upon the fact that complex nitrogenous organic bodies are partially decomposed by boiling with a strong oxidising agent—namely, an alkaline solution of potassium permanganate. This test does not give the whole amount of the organic nitrogen present in the sample, but rather that portion of it which is liable to cause putrefaction when undergoing decomposition.

To the liquid left in the boiling flask after the free ammonia has been collected a measured quantity of potassium permanganate in caustic potash or soda is added. The liquid in the flask is then boiled, and the distillate collected in a 100-c.c. stoppered cylinder, with two further 50 c.c. collected in Nessler tubes. These distillates are compared against a similar standard as the ammoniacal nitrogen on a Stoke's calorimeter. If the 100 c.c. of the distillate is stronger than the standard, then an aliquot proportion of it is read.

Where the four hours' oxygen test is not adopted as the standard by the rivers authorities, the albuminoid nitrogen test is generally used, with the following classifications:—

Below 0·1 parts per 100,000—good.

Between 0·1 and 0·15 parts per 100,000—fair.

Between 0·15 and 0·20 parts per 100,000—unsatisfactory.

Over 0·20 parts per 100,000—bad.

Nitrates (Nitric Nitrogen).—This is an [illegible] product of the oxidation of ammonia to nitrate by the agency of bacteria. Owing to the fact that nitrites and nitrates are formed practically [illegible] but or no nitrate is found in a healthy bacterial filter. It is also formed by the reduction of nitrate, and it is no doubt due to this reduction when it is found in a filter. Consequently, when a filter shows [illegible] of an appreciable quantity, say 0·2 parts per 100,000, it is a fairly true index that there is insufficient aëration in the filter, due possibly to it being sealed over, and requires immediate attention. Of course, this estimation is only necessary with filter effluents. The method of estimation is by adding to 50 c.c. of the sample 2 c.c. of Greiss-Ilosvay's solution, and allowing it to stand twenty minutes, when, if any nitrite is present, a brilliant red colouration is produced, the intensity being in proportion to the nitrite present. This, at the end of the twenty minutes, is compared against a standard solution of sodium nitrite (made from silver nitrite), similarly treated to the sample.

Nitrates (Nitric Nitrogen).—This estimation is of great importance, as it shows to a certain extent the efficiency of the filters. It is, of course, the nitrogen in the organic matter oxidised to nitrates. If all the nitrogen in the sewage was eliminated on passing through the filters, only about 66 per cent of it would be accounted for by the nitrate, the remainder having possibly escaped into the atmosphere as nitrogen and its oxides.

The estimation is carried out by placing a measured quantity of the filter effluent in a conical flask, together with the same quantity of water and 2 c.c. of a 10 per cent solution of sodium carbonate. This is then boiled down until all the free ammonia has been expelled. The liquid is now slightly acidified with acetic acid and poured on to a copper zinc couple. The acid in the liquid acts on this couple, forming nascent hydrogen, which has the power of reducing nitrate to ammonia. After contact with the couple for at least twelve hours, the liquid is poured into a boiling flask on the condenser, containing a solution of sodium hydrate. (This water has already been boiled to expel any ammonia present.) The flask is now coupled up and the liquid boiled. A quantity is distilled off and treated exactly as the ammonias previously described—viz., by taking an aliquot proportion of the distillate, Nesslerising, and reading against the standard ammonium chloride solution on a Stoke's calorimeter.

The tests described form the routine tests carried out in the Southall-Norwood laboratory, and are, in fact, the routine tests adopted at most sewage works laboratories, in conjunction with any special ones which local circumstances demand, such as the following:

(1) *The [illegible] Test.*—[illegible] value when considering the question of precipitants. A description need not be given here, as a full explanation was given in a paper read before the Society of Chemical Industry by Dr. Fowler and two of his assistants, and can be seen by referring to their *Journal*, vol. xxvii.

(2) *The [illegible] Test.*—When [illegible] at 27 deg. Cent. for seven days, the amount of oxygen absorbed from acidified potassium permanganate in three minutes being estimated before and after incubation, a higher figure after incubation points to the fact that putrefaction has taken place during the incubation period. It is of interest to note that a fairly good sample void of nitrate may show signs of putrefaction, while a sample far worse, but containing nitrate, would keep, but, of course, at the expense of the nitrate.

(3) *Excess of Lime in Tank Effluent.*—Where lime is used as a precipitant, the estimation of the caustic alkalinity of the tank effluent is of great value, as not only does it prevent waste of lime, but also prevents a liquid being obtained from the tanks which is capable of dissolving organic matter, and consequently further taxing the filters. An excess of lime in the tank effluent also encourages an objectionable grey growth on top of the filters. On the other hand, a slight trace is, no doubt, helpful for nitrification, as it furnishes a base for the nitric acid formed.

The author has given an all too brief description of the tests and estimations usually carried out in a sewage works laboratory, and in conclusion he would advise those who would go more deeply into the matter to study some of the recognised text-books on sewage analysis, which include a description of other tests not mentioned—such as the estimation of iron, fatty matter, sulphur compounds, &c.

Cudworth Councillors and Conference Expenses.—The Local Government Board wrote to the Cudworth Urban District Council sanctioning the payment of the reasonable expenses "of the surveyor or other officer of the council concerned with the housing and town planning question and one other delegate" attending the proposed conference at Leeds. The council had in the first place decided to send three members to the conference, and it was felt they should not be represented at all on the conditions proposed by the Local Government Board. It was therefore decided by five votes to four not to be represented at the conference.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

The Value of Mechanical Filters in the Purification of Water.

ROYAL SANITARY INSTITUTE DISCUSSION AT SHREWSBURY.

There was a very large attendance at the recent meeting of the Royal Sanitary Institute at Shrewsbury, at which Dr. Thomas Orr, the medical officer of health of that town, opened a discussion on the value of the mechanical filtration of water. The chair was taken by Mr. H. Percy Boulnois, M.INST.C.E., Westminster, who, in introducing Dr. Orr, commented on the interest of the subject.

Mr. Martin Deacon (London) said that Dr. Orr, in his most interesting paper,* had dealt fully with the efficiency of the mechanical filter under varying conditions. He had touched upon the capital cost, the cost of treatment and maintenance, and he had drawn comparisons between the mechanical process and that of the ordinary slow sand bed process. With regard, firstly, to the capital cost, he (Mr. Deacon) was of opinion that some of the figures which are published, and statements which are frequently made as to the capital cost per 1,000,000 gallons of the mechanical process, are most misleading. Mr. John Don, in his paper read before the Institution of Mechanical Engineers in 1909, included a table purporting to show the capital cost per 1,000,000 gallons of the various makes of mechanical filters, and he added a note at the foot of the table to the effect that "the figures may be taken as substantially correct, as they are provided by the proprietors of the various makes." So far as the manufacturers were concerned these figures, varying between £2,100 and £2,800 per 1,000,000 gallons, might be correct, but the engineer finds it necessary to call for many articles which are not included by the manufacturers, but which, in his opinion, are necessary in order that the process may approach the safety and efficiency of that of the slow sand bed. Dr. Orr had said that one of the advantages of the mechanical process was that the plant was under cover. The cost of that cover, consisting of a building, must be included; and Mr. Deacon was of opinion that the capital cost varied between £4,000 and £6,000 per 1,000,000 gallons. Even with these increased figures there was a considerable saving over the capital cost of the slow sand bed process, which might vary between £8,000 and £10,000 per 1,000,000 gallons, according to the particular locality. He ventured to think that it was this saving in capital cost which had been responsible for the introduction of many of the mechanical plants which have been installed in this country, but where investigation had shown, after a period of running, that the annual cost to the authority was actually greater than would have been the case had the slow sand bed process been introduced. Taking everything into consideration, he had come to the conclusion that, whereas the mechanical process was about half the capital cost per 1,000,000 gallons of the slow sand bed process, the cost of maintenance and treatment was about double. Dr. Orr, on page 16 of his paper, had quoted figures of the cost of maintenance and treatment both of the slow sand bed process and of the mechanical process, and for the former he gave 12s. 11d. per 1,000,000 gallons. The late Mr. W. B. Bryan might certainly be taken as an authority of great experience on this subject, and he had given 6s. per 1,000,000 gallons; and we to-day in this country were doing the work at 4s. 2d. per 1,000,000 gallons, as compared with 12s. 11d. as quoted by Dr. Orr. He (Mr. Deacon) pointed out that a plant of mechanical filters had been installed to deal with close on 3,000,000 gallons a day. In an almost adjacent valley, with a similar water from the same range of hills, the late Dr. Deacon constructed slow sand beds. The capital cost of the mechanical plant was £5,730 per 1,000,000 gallons, and of the slow sand beds £9,000 per 1,000,000 gallons. Adding the repayment of the loan on the mechanical plant at 4 per cent over thirty years to the annual cost of treatment and maintenance, the annual cost per 1,000,000 gallons is £50; while adding the repayment of the loan on the slow sand bed scheme at 4 per cent over sixty years to the annual cost of treatment and maintenance, the annual cost per 1,000,000 gallons was £464. These two systems were introduced among other things to prevent plumbo-solvent action, and he notes from the paper that Dr. Orr came to the conclusion that the mechanical filter process was the proper one for this purpose, but Mr. Deacon entirely disagreed with this conclusion. Dr. Deacon added crushed limestone to the millstone grit sand, and though the raw water dissolved 17·4 parts of lead per 1,000,000 gallons, the filtered water was alkaline. Not only was the slow sand bed process cheaper per annum, but it had the advantage that the beds were washed at intervals of only from three to six weeks, whereas the mechanical plant was washed every two or three days. There is no doubt that, while it lasted, the efficiency of the mechanical filter compared favourably with the slow sand bed, provided the process was carefully supervised, but in his opinion the design of the mechanical filter was engineeringly bad. Any machine was bad which, very soon after arriving at its highest efficiency, had to be stopped and thrown out of action at very frequent intervals. He put forward a suggestion to the manufacturers that his machine would be infinitely more valuable if some form of roughing plant were introduced, thus prolonging the life of the final bed. He was of opinion that for the removal of peat stain the mechanical filter was necessary, as it was the only economical means of introducing a coagulant which was required for the complete removal of the colour, and where the frequency of the washing of the sand was not serious. Mr. Boulnois had asked him to say a word on the Ransome filter, and he did so because it introduced an entirely novel condition. The Ransome filter was in no sense of the word a mechanical filter, there being none of the apparatus necessary which gave the name "mechanical" to the pressure type of filter. It was a pressure or gravity filter with a portion of the sand kept continuously in motion, and through which the water passed as a roughing filter before passing through the stationary and final bed of sand underneath the moving sand. The removal of bacteria and peat stain had been shown to be most extraordinarily good, and the fact that moving sand was used threw doubts upon the generally accepted theory that a surface film was required for the efficient treatment of the water, for in the moving sand no permanent film was formed. The effect of the moving sand, which carried away a very large proportion of the impurities, was to reduce the number of washings to from thirty to forty per annum, as compared with from 300 upwards when the sand had been kept stationary, and at the same time, no doubt owing to the preliminary roughing, the efficiency was exceptionally high.

Alderman Meeson Morris, chairman of the Shrewsbury Sanitary Committee, said that in 1909 he was instrumental in bringing their council to lay down Bell's pressure filters for dealing with the Severn water at that town, and he claimed they had given full satisfaction, and that the council had been amply justified in the step they took. Looking at the matter from a practical standpoint, one of the most striking results of their use of these filters was that, whereas up to 1909 they were never without a high percentage of enteric fever cases in the borough, since the laying down of these filters they had not had a single case of enteric that had originated in the town.

Dr. S. Rideal (London) said he had seen the mechanical filters at Shrewsbury some years ago, and at his suggestion the chlorine treatment had been adopted in order further to improve the bacterial quality of the river Severn water. This river, throughout its course, formed a most interesting hydrographical study, as it consisted of waters with nearly all characteristics, and yet it was amenable to treatment, and formed the drinking supply of several communities living on its banks. At Shrewsbury, at certain times of the year, it consisted largely of the dark peaty water which came down the river Vyrnwy, and this again, it was interesting to note, was largely made up of compensation water from the Liverpool reservoir. This compensation water came from the bottom of the Vyrnwy reservoir, and was so dark coloured and void of oxygen that it might be regarded as the rejected water of Liverpool, and yet by the mechanical filters, alum treatment, and chlorine sterilisation, Shrewsbury had successfully converted it into a very excellent water which he, for one, would

* See last week's Surveyor.

not hesitate to use for all purposes. The Local Government Board were undoubtedly justified in the past in regarding river supplies with suspicion, but the old-fashioned open sand filters which were so generally used in this country, and notably in the case of London with its Thames and Lea derived waters, had been shown by Dr. Houston and others to fail in producing a sterile water, or one in which every dangerous water-borne organism was eliminated, and they had seen during the past fifteen years that the large storage reservoirs required primarily for quantity requirements had in addition a remarkable quality characteristic, so that the combination of long storage of two months or more in the case of the polluted Thames, plus the open sand filters, had so far kept the London water supply up to bacterial standards of purity. The mechanical filters might at times give a percentage purification as good as an open sand filter, especially when a carefully adjusted alum coagulant was used, but percentage purification figures were misleading, as the subject of water purification must be to limit the number of chances of bacterial contamination in the finished water, and he believed by chlorine sterilisation after mechanical filtration a better and more certain result could be obtained than by the alternative of prolonged storage plus ordinary sand filtration. He wished to emphasise the point that mechanical filters were able to deal with waters of a very variable character, and he ventured to think that the removal of iron, the prevention of plumbism, and the precipitation of peat-colouring matter could all be undoubtedly effected better by a well-regulated mechanical filter than in any other way. By chlorine addition we had now a further powerful weapon, which in America was now very generally used, and could be simply adjusted to the draught or pumping capacity in such a way as to prevent any unpleasant taste to the water and yet ensure a bacterial purity hitherto unattainable by open sand filters. The attempt to find pure water in Nature had been very costly. During the Boer War Dr. Parkes and himself suggested a sterilising tablet for use against typhoid in South African waters, and now in Flanders our troops were provided with a mechanical filter, followed by a bleaching-powder treatment practically the same as in use at Shrewsbury. Only that day he had been consulted with regard to a sewage from a large military camp in England which it was proposed to discharge into a river which joined the water supply of one of our large towns which he thought was the very first to adopt a mechanical filter for treatment of river water in England, and it would be interesting to see how it dealt with this suggested new pollution.

Mr. LEAN, engineer to the Truro Waterworks Company, gave his experience there with the Candy filter, and said when once the public had got rid of the objection to the chemical process it would solve the great difficulty of getting an absolutely pure supply, and enable small water companies and small municipal authorities to obtain one of the best methods of dealing with the water yet known.

Mr. F. PARR, borough surveyor of Bridgwater, said he had advised his authority to go in for a treatment of the water supply of that town by some mechanical filtration scheme.

Mr. F. PULLEN CANDY (London) said that the Candy filter which Dr. Orr had described in his paper was the type known as the "packed" filter, such as was largely used for removing iron from water, and it was not the type of filter specifically made for removing bacteria. In addition to the "packed" type, Candy filters were made with a loose bed of sand cleaned by a reversed flow of water, plus a scouring system, and this was the type of filter recommended when chemical treatment was employed. In connection with this type of filter there was no doubt that better bacteriological results could be obtained when coagulants were used than when coagulants were not used. Mr. Martin Deacon had mentioned in his remarks that water engineers would look with favour upon a mechanical filter which combined a pre-filter. The Candy Filter Company made such a filter, which was known as the "Compound" filter, and in this a separate bed of coarse material was provided through which the water was filtered before passing on to the fine bed. As Mr. Martin Deacon said, such a filter would cost a little more than the ordinary type, but it had a very great advantage in dealing with thick water. With regard to the question of the employment of chlorine to ensure a perfectly safe drinking water, the speaker did not agree with Dr. Orr that the chlorine treatment had not had a sufficient trial; he would instance Reading, Truro, and Teignmouth as places where the Declor system had been in operation for several years with most satisfactory and gratifying results. The War Office has also adopted the Declor system for several large installations in this country to produce safe drinking water for the troops. As regarded the amount of chlorine added to the water, 1 part in 2,000,000 parts of water, such as Dr. Orr told them was used at Shrewsbury, was a very small quantity for such a water. They (the Candy Filter Company) had had very considerable experience in dealing with large quantities of water by chlorine treatment, and in some instances they found that at times as much as 6 parts of chlorine to the 1,000,000 was necessary. It was a great advantage of the Declor process that the free chlorine after doing its work was removed by an insoluble material, so that there was no necessity with that process to cut the quantity of free chlorine down to so minute an amount as to endanger its powers of absolutely destroying the bacillus coli and the typhoid bacillus.

Mr. DIXON (Ashton-under-Lyne) expressed himself as a firm advocate of the mechanical filter.

Mr. WALBURGH WARD, borough surveyor of Shrewsbury, said that in his judgment mechanical filters were worked at too high a rate. A slower rate of working would not only increase their efficiency, but extend the life of the filter, and make the washing process less frequently necessary.

Mr. LASSEN said he might allude to two points in the paper to which allusion might perhaps be permitted from a standpoint not hitherto referred to—he meant the removal of iron from water, and the after-treatment of chlorinated water by means of filtration through a bed of manganese "permutit." When treated by manganese chloride, and subsequently with potassium permanganate, ordinary artificially made sodium "permutit" exchanged its base for manganese, and then acquired a capacity for holding a very high oxide of manganese in such condition as to present it most efficiently to any body of water flowing through the material. By this means the iron in the water was oxidised and thrown out into suspension completely. The action of this artificial oxidising agent was much more intense than that of any filtering medium previously known, and it would therefore be appreciated (and had been demonstrated in large commercial plants) that there existed in manganese "permutit," at the disposal of the water engineer, a means for rapidly and efficiently freeing iron-contaminated supplies from iron in solution by means of a plant which was compact and extremely simple in its operation. Not only was the oxidising action referred to of a very intense activity, but the mechanical filtering power of the "permutit" itself was above that of other accepted media. The second point, which was influenced by the activity of manganese "permutit" for abstracting iron out of a water supply was that of bacteriological purification by means of chlorine. Dr. Orr had put before the meeting some interesting figures in this connection, and these were further supported by investigations which had been carried out by public authorities both in this country and in France. Using sodium-hypochlorite upon crude Thames water and upon crude Seine water without any pre-filtration, it had been found possible to render both these waters absolutely safe for drinking purposes by means of this treatment. The chief point, however, to which he should like to draw attention was the fact that chlorination was only effective by reason of the oxygen which it set free, and therefore abstracted from the water, and to that extent, therefore, the water was flattened and its palatability very materially damaged. The research work referred to had shown that my means of final filtration through a bed of manganese "permutit," not only could filtration of all excess chlorine be carried out by ferrous sulphate in excess, but the water again raised to a state of oxygenation as high—or higher—than that of the crude. By means of manganese "permutit," therefore, chlorination of a contaminated supply could be effected with the certainty that all traces of excess chlorine could be removed, irrespective of the use of a dose greater than that necessary to sterilise. Experiments conducted upon river water contaminated to a point represented by the presence of B.coli in 0·01 of a c.c., showed that without any pre-filtration this water could, after chlorination, subsequent dechlorination with ferrous sulphate and final filtration through manganese "permutit," be delivered crystal clear, of a faint bluish-white tinge, and entirely free of traces of chlorine or iron. Sterilisation was so complete as to give negative results in the test for B.coli in 400 c.c.'s,

while bacteria which in the crude water numbered 8,650 per c.c., were reduced in the treated water in six tests respectively to 38, 56, 37, 26, 46, and 27. In all cases seventy-two hours' incubation was allowed.

The Chairman (Mr. H. Percy Boulnois), in closing the discussion, said if it had not been for Mr. Deacon it would have been a pæan of praise for the pressure filter. There were conditions in which pressure filters might be used, and conditions in which ordinary gravity filters might be used. Dr. Rideal had said it was a chemical age. He (Mr. Boulnois) called it an age of hurry. They were all in a hurry to get things done, and, to paraphrase an old saying, they might "Filter in haste and repent at leisure." He proposed a very hearty vote of thanks to Dr. Orr for his paper, and for acting as honorary secretary for that meeting, and thanks to the Mayor and Corporation of Shrewsbury for the use of their Guildhall.

The motion was carried with acclamation.

Dr. Orr, in reply, said as regards Mr. Deacon's remarks he thought it would be advisable to have the details of all the costs he had given before them, so that they go into them carefully, because as he (Dr. Orr) made it out, the cost was far and away in favour of mechanical filters.

The members met at the Guildhall on the following morning in beautiful weather, and had an enjoyable visit to the housing scheme of the borough at Ditherington, proceeding afterwards to inspect the mechanical filters and the public abattoir.

At one o'clock the Mayor of Shrewsbury, Alderman Maynard How, received the members at a reception in the beautiful Speech Hall of the secondary school of the borough. Luncheon followed, his Worship being supported by Mr. H. Percy Boulnois; the chairman of the Salop County Council, Sir J. Bowen Bowen-Jones, Bart.; and a number of the members of the Shrewsbury Corporation, including the chairman of the Sanitary Committee, Alderman Meeson Morris; and the chairman of the Water Committee, Councillor Grocott. Among others present were Mr. G. Butler Lloyd, M.P. for Shrewsbury; the clerk to the Salop County Council, Mr. Frederick Crowte; and the town clerk, Mr. R. F. Prideaux.

Following the toast of the King,

Mr. Boulnois, amid applause, said it was his pleasing duty to propose the health of their host, Alderman Maynard How. They of the Royal Sanitary Institute had had on that occasion a record meeting. They had had an exceedingly good gathering on the previous night, and an exceedingly interesting discussion on Dr. Orr's paper; and although there were more advocates of the mechanical filters than of the gravity system, the discussion was of great value, and he, old as he was, had learned a great deal. The Royal Sanitary Institute had been in existence for a great number of years, and was almost a unique society, because it embraced so many different professions. It had among its members a great many medical officers of health, architects, engineers, and scientists, as well as laymen, and he ventured to say that the work of the institute had done a great deal toward ameliorating the condition of the people. That morning they had looked at a great deal of interesting work in Shrewsbury, beginning with their housing scheme. He himself, when city engineer of Liverpool, took a considerable interest in the housing question, and he thought that Shrewsbury had done the right thing in erecting houses such as they had at rentals of 5s. 6d. a week. They were admirable cottages, and he personally would not mind living in one himself. Then again at the filter works Shrewsbury had done a wonderful work. The water of the Severn was not above suspicion, and he might say that when he was deputy chief engineering inspector of the Local Government Board Shrewsbury gave them a great deal of thought. Shrewsbury hitherto had been celebrated for two things—one, as having been the birthplace of Darwin; and two, for its cakes. Now he thought it had another great claim, inasmuch it was the one town that had defeated the Local Government Board. They heard the previous night that the water supply of Shrewsbury was absolutely above suspicion, although it came from a suspected river, and that enteric fever had diminished to such an extent that there was now no cases in the town—that was an extraordinary record. Mr. Boulnois, concluding, said, as respecting the Sanitary Institute, he had to thank the mayor for his hospitality in that charming hall, and he asked them to drink the health of his Worship.

The toast was received with acclamation.

The Mayor, in reply, said he was grateful to Mr. Boulnois for his graceful thanks, and also for the very interesting speech he had made. In regard to what he had said of the Local Government Board, if Mr. Boulnois were still there he would suggest to him that at a time like this, when we were all seeking to act in unity, that board might do well to bury the hatchet, for he believed they had never quite forgiven Shrewsbury. The mayor, continuing, said it was a pleasure to him to be there, and first he wished to welcome the Royal Sanitary Institute, and say how much pleasure he had had in being able to entertain them.

PHILADELPHIA SEWAGE SCHEME.

HUGE OUTLAY PROPOSED.

Containing recommendations for work involving an expenditure of £6,900,000 to meet conditions in the year 1950, the final report of the Bureau of Surveys on the comprehensive plan for the collection, treatment and disposal of the sewage of Philadelphia was, an American exchange states, submitted to the city council recently. The project is on such a large scale that it is possible at this time to give only a bare outline of its main features.

Sewage collected by the city's present system will be intercepted and conveyed by transverse collectors to three sites where treatment works will be installed —one on the Delaware River for the northern part of the city, one on the Delaware River for the southeastern part, and the third at the mouth of the Schuylkill for the central and western parts.

The first method of sewage treatment recommended at the north-east and south-west works involves coarse screens, grit chambers, and two-story sedimentation tanks of the Imhoff type. As the volume of river water available for the assimilation of the effluent of the works remains practically the same, while the volume of sewage produced by the city steadily increases, due to growth in population, it may be necessary in the future to compensate for this increase in the amount of sewage by more refined treatment, which will probably consist in the oxidation of the tank effluent in percolating filters, or by such other methods as may be approved at that time.

The treatment of the sewage carried to the south-east works will consist of coarse screens, grit chambers and fine screens. The effluents of the proposed works will be disposed of by diffusion in the Delaware River through submerged outfalls so located that the treated sewage will be rapidly distributed in the great tidal flow, thus utilising to the fullest extent the oxidising power of the river.

A definite programme has been arranged for the expenditure of the funds on the proposed system. There is needed immediately an appropriation of £1,000,000 for the purchase of land at the sites of the three proposed treatment works, for the construction of collecting sewers, and for the construction of sewage treatment works at the north-east site. These works will protect the Delaware River in the vicinity of the source of the city's water supply.

It is recommended that subsequent appropriations should be made as rapidly as possible for the construction of the collecting sewers, pumping stations, treatment works, and appurtenances generally.

It is also recommended that there should be co-operation between the states of Pennsylvania and New Jersey, so as to secure concordant action for the treatment of the sewage of communities in these States, which is discharged into the Delaware River or its tributaries.

Bourne's New Isolation Hospital.—An isolation hospital built by the Bourne Rural District Council on the main road to Peterborough at a total of over £6,000, was formally opened last week.

New Park and Recreation Ground at York.—A new park and children's recreation ground, to be known as Glen Gardens, Heworth, in the Monk Ward, York, was publicly opened last week. The estate, which comprises 8½ acres, was purchased in 1911 by the corporation for £3,000, the owner foregoing its real value on the condition that it was dedicated as an open space for ever. Since then some £1,800 has been spent in laying it out. There is a full-sized bowling green, four tennis courts, and a promenade, with shrubberies which occupy 3 acres. The remainder consists of two playing fields, one for young children, and one for older children. A well-built pavilion, in the Old English half-timbered style, is also provided.

THE PROVISION OF SANATORIA.

A MIDDLESEX COUNTY COUNCIL SCHEME.

In the House of Commons on Monday the President of the Local Government Board was asked whether, in connection with the proposed building of a sanatorium by the Middlesex County Council at Mayfield, Essex, he is aware that since the outbreak of war the council have decided that, while completing the purchase of the site, it was not desirable to apply for the consent of the board to borrow a large sum of public money for the building, or to apply to the Public Works Loan Commissioners for a loan, owing to the public in competition with the Treasury at a time like the present, when the whole resources of the country are urgently required to be husbanded or employed for the vigorous prosecution of the war in order to bring about its speedy conclusion; and whether such course has received his sanction.

The President of the Local Government Board (Mr. Walter Long) said he was aware of the resolutions passed by the county council at their meetings in January and May last. No sanction on his part was required in the circumstances described in the question; but if the hon. Member wished to know whether he thought that arrangements of the kind should be postponed in the present circumstances, he could inform him that he did.

Coast Sand Dunes, Sand Spits, and Sand Wastes. (By G. G. Case. Price 4s. St. Bride's Press, Limited, 24 Bride-lane, E.C.). . . . "A most useful little book crammed with facts culled from all parts of the world and well illustrated with photographic reproductions and diagrams. Numerous references to other works are given. Mr. Case discusses the formation and distribution of sand dunes and the devastation caused by them when they move inland, and then goes on to consider protective works and the reclamation of sand wastes. If we have one criticism to offer it is that the book is too condensed. There is certainly not a superfluous paragraph."—*Geographical Journal.*

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

EAST MIDLAND DISTRICT.

A meeting of the institution will be held in the East Midland District at the Town Hall, Matlock, to-morrow (Saturday, June 12th).

PROGRAMME.

11.30 a.m.—Assemble in the Town Hall, Matlock, where the members and visitors will be received by the chairman (Mr. D. M. Wildgoose, J.P.) and members of the Matlock Urban District Council.

11.45 a.m.—A short paper on Matlock will probably be read, but has not yet been arranged.

12.15 p.m.—Visit pleasure grounds and cable tramway.

1 p.m.—Luncheon at the Crown Hotel. (Tickets, 2s. each.)

2.15 p.m.—Drive to the new sewage disposal works, where a description of the same will be given by a representative of the firm of Messrs. J. Diggle & Sons, the engineers for the scheme.

3.30 p.m.—Leave sewage works, and proceed to Messrs. Smedley's hydropathic establishment to inspect baths, &c.

4.45 p.m.—Afternoon tea will be provided here by the kind invitation of the directors of Messrs. Smedley's.

6.15 p.m.—Arrive at the town hall.

(Conveyance tickets, 1s. 3d. each.)

E. H. Crump, Assoc.M.Inst.C.E.,
Hon. District Secretary.

Hinckley.

ANNUAL GENERAL MEETING.

The forty-second annual general meeting of the institution will be held at the Institution of Civil Engineers, Great George-street, Westminster, on Thursday and Friday, June 24th and 25th, followed by visits on Saturday, June 26th.

[The full programme will be found in The Surveyor of June 4th.]

J. W. Dudley Robinson,
Secretary.

INSTITUTION OF WATER ENGINEERS.

TWENTIETH SUMMER GENERAL MEETING.

The twentieth summer general meeting of the Institution of Water Engineers will be held at the apartments of the Geological Society of London, Burlington House, W. (kindly lent for that purpose by the president and council of that body), on Friday, June 18th, commencing at 3 p.m.

The following papers will be read and discussed:—

(1) "The Effect of Springs upon Water-levels in the Chalk of Eastern Surrey," by Henry Dewey, F.G.S. (H.M. Geological Survey).

(2) "The Hydro-Geological Conditions of Newbald, East Yorkshire," by Percy Griffith, M.Inst.C.E., F.G.S.

PROGRAMME.

The chair will be taken by the retiring president (Mr. Thomas Molyneux), and the minutes of the nineteenth winter general meeting, held in London on December 11, 1914, will be read and put for confirmation.

The names of members, &c., elected since the last general meeting will be announced, and those present will be welcomed by the president.

Introduction of the new president (Mr. F. W. McCullough, M.Inst.C.E., J.P.), and presentation of certificate of election.

Vote of thanks to retiring president.

The new president will present a short report upon the work of the institution during the past year.

Reading and discussion of papers.

ROYAL SANITARY INSTITUTE.

YEOVIL MEETING.

At Yeovil, on July 14th, a discussion on "Water Supplies to Rural and Small Urban Areas" will be opened by Dr. W. G. Savage, county medical officer of health of Somerset.

Fire Tests with Fire Extinguishers. The Pyrene fire extinguisher, which takes the form of a double-action hand squirt containing a quart of chemical of the carbon tetrachloride class has recently been tested by the British Fire Prevention Committee, who have now issued their report (No. 189). The testers notified the committee that their appliance was not suitable for the ordinary fire tests with loose, inflammable materials, as required under the committee's standard for ordinary extinguishers. These, as a rule, comprise the ordinary burning crate, packing cases, burning logs, and so forth. The tests that were undertaken were the easier part of the committee's series of petrol tests—*i.e.*, those with small quantities of petrol over a limited area—and the summary of the report indicates that the extinguisher is able to deal with such miniature fires of limited area if the quantity of spirit is kept within 2 gallons. There were also some tests with small quantities of certain chemicals, and it was shown that the appliance was efficient for small celluloid fires with films up to a length not exceeding 100 ft. In other words, this appliance is primarily useful for small spirit fires as met with in motor-car work, &c., but is in no way applicable to ordinary fires. A weak spot regarding the appliance is the pungent smoke it generates when applied to fire, that makes it inconvenient for use indoors. Hydrochloric acid is apparently generated, and the fumes of which are of an acrid character affecting the operator. Thus, generally speaking, this appliance has limited uses which must not be confused with general uses.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

GAS ENGINEER.—June 12th.—Stoke-on-Trent Corporation. £500—£700 per annum.—Mr. E. B. Sharpley, town clerk.

BOROUGH SURVEYOR.—June 12th.—Corporation of Wenlock. £200 per annum.—Mr. F. H. Potts, town clerk.

BOROUGH ENGINEER AND SURVEYOR.—June 14th.—Woolwich Borough Council. £500—£650.—Mr. Arthur B. Bryceson, town clerk.

INSPECTOR OF NUISANCES.—June 14th.—Colwyn Bay Urban District Council. £150 per annum.—Mr. J. Amphlett, clerk.

BURGH SURVEYOR.—June 16th.—Inverness Town Council. £250 a year.—Mr. K. Macdonald, town clerk.

ROAD SURVEYOR.—June 17th.—Forfar District Committee of the Forfarshire County Council. £300, with £50 for travelling expenses.—Mr. J. P. Anderson, district clerk, Municipal Buildings, Forfar.

DISTRICT SURVEYORS (2).—June 18th.—London County Council.—The Clerk, County Hall, Spring-gardens, S.W.

SANITARY INSPECTOR.—June 21st.—Corporation of Mansfield. £100—£140 per annum.—Mr. J. Harrop White, town clerk.

ROAD SURVEYOR.—June 23rd.—Denbighshire County Council. £100 per annum, with travelling expenses.—Mr. W. R. Evans, clerk, County Offices, Ruthin.

TEMPORARY CLERK.—Corporation of Cheltenham.—Borough Engineer, Municipal Offices, Cheltenham.

SANITARY INSPECTOR.—Finsbury Borough Council. £3 per week.—Medical Officer of Health, Town Hall, Rosebery-avenue, London, E.C.

DRAUGHTSMAN.—Public Works Department, Government of the Gold Coast. £250—£300.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ASSISTANT ENGINEERS.—Public Works Department, Government of the Gold Coast. £350—£400.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

GLAMORGAN.—June 12th.—For repairs and alterations to schools, for the county council.—Mr. T. Mansel-Franklen, clerk, County Hall, Cardiff.

WEST SUFFOLK.—June 14th.—For repairs at certain schools, for the Education Committee.—Mr. A. A. Hunt, county architect, 51 Abbeygate-street, Bury St. Edmunds.

CREWE.—June 15th.—For the erection of three cottages, for the corporation.—Mr. G. Eaton-Shore, borough surveyor.

GREENOCK.—June 15th.—For the erection of 150 houses, for the corporation.—Office of Public Works, Municipal Buildings.

ALNWICK.—June 17th.—For additions to the public slaughter-house, for the urban district council.—The Slaughter-house Committee.

FAILSWORTH.—June 18th.—For converting privy-closets into water-closets, for the urban district council.—Mr. W. M. Shimmin, engineer and surveyor, Oldham-road, Failsworth.

BRADFORD.—June 19th.—For the erection of a caretaker's house, for the Education Committee.—City Architect, Town Hall.

EVESHAM.—June 19th.—For additions and alterations to sanatorium, for the Joint Hospital Board.—Mr. H. S. Harvey, architect and surveyor, Town Hall.

CASTLEBAR.—June 19th.—For building four cottages, for the rural district council.—The Clerk.

LEEDS.—June 21st.—For the erection of a two-story building, for the corporation.—Town Clerk.

BLACKPOOL.—June 23rd.—For excavating and underpinning at the electricity works, for the corporation.—Mr. John S. Brodie, borough surveyor.

DURHAM.—June 25th.—For taking down and re-erecting two iron schools, for the Education Committee.—The Clerk, Shire Hall, Durham.

WILTS.—June 25th.—For alterations and repairs to various schools, for the Education Committee.—Mr. J. George Powell, county surveyor, Trowbridge.

LONDON.—June 30th.—For repairs and cleaning works at Homerton Asylum, for the Metropolitan Asylums Board.—Board Offices, Embankment, E.C.

GODALMING.—June 30th.—For the erection of a sanatorium, for the Metropolitan Asylums Board.

ALDERSHOT.—For the re-erection of a temporary hospital. Offers invited from owners of wood or iron buildings.—Mr. F. C. Uren, surveyor.

BOOTLE.—For alterations to school lavatories, for the corporation.—Borough Engineer.

Engineering: Iron and Steel.

HALIFAX.—June 12th.—For the supply and fixing of a hot-water boiler, for the Education Committee.—Mr. J. Lord, borough engineer.

YORK.—June 14th.—For the construction of two 30-in. cast-iron pipe lines, for the corporation.—Mr. F. W. Spurr, city engineer, Guildhall.

PORTHCAWL.—June 14th.—For supplying and laying cast-iron gas mains, including specials, for the urban district council.—Mr. Evan Davies, clerk.

MANCHESTER.—June 15th.—For making embankment watertight, for the Sanitary Committee.—City Architect.

DUMFRIES.—June 15th.—For the supply of steel and ironwork portions of two light-traffic iron girder bridges, for the Thornhill District Committee.—Mr. J. S. Rankin, road surveyor, Waulkmill, Thornhill, Dumfries.

DUBLIN.—June 15th.—For the supply and erection of four Lancashire boilers, for the Office of Public Works.—Mr. H. Williams, secretary.

CASTLEBLAYNEY.—June 16th.—For improvements to the waterworks pipe line, for the rural district council.—Mr. F. Bergin, 36 Westmoreland-street, Dublin.

EAST STOW.—June 16th.—For the construction of a bored well, trial pumping, and other works, for the rural district council.—Messrs. J. Taylor & Sons, engineers, Caxton House, Westminster, S.W.

REIGATE.—June 19th.—For supplying and erecting at the sewage disposal works, Earlswood, one Manlove, Alliott & Co.'s air-compressing plant, for the corporation.—Mr. F. T. Clayton, borough surveyor.

MOTHERWELL.—June 21st.—For excavations in connection with laying of gas mains, for the corporation.—The Gas Engineer, Mill-road, Motherwell.

MAESTEG.—June 21st.—For the construction of a retaining wall, carriageway, footway and four-stall urinal, for the urban district council.—Mr. S. J. Harpur, engineer.

MADRAS.—July 14th.—For the supply of cast-iron pipes, special castings, sluice valves and hydrants, for the corporation.—Mr. J. W. Madeley, special engineer; agents, Messrs. James Mansergh & Sons, 5 Victoria-street, Westminster, London, S.W.

RANGOON.—August 11th.—For the installation of a system of fire alarms, for the municipality.—Messrs. Ogilvy, Gillanders & Co., 67 Cornhill, London, E.C.

Gas and Electricity.

KIRKCALDY.—June 14th.—For the supply of 100 half-watt, 1,000-c.p. lamps and lanterns, for the corporation.—Mr. O. F. Francis, burgh electrical engineer and tramways manager, Electricity Works, Kirkcaldy.

REDDITCH.—June 14th.—For the supply of high-tension three-phase switchboard, for the urban district council.—Messrs. Handcock & Dykes, engineers, 11 Victoria-street, Westminster, S.W.

AYLESBURY.—June 14th.—For the supply of metallic-filament electric lamps, for the urban district council.—The Surveyor.

WEST HAM.—June 14th.—For the installation of the electric light and low-pressure hot-water heating apparatus, for the Education Committee.—Mr. W. Jacques, architect, 2 Fen-street, Fenchurch-street, E.C.

STOURBRIDGE.—June 15th.—For the supply of an exhauster, for the Gas Committee.—Mr. C. H. Webb, engineer and manager, Gasworks.

EDINBURGH.—June 21st.—For the supply of two 5,000-kw. turbo-alternators and condensing plant, for the corporation.—The Engineer, Dewar-place, Edinburgh.

Roads.

TIPPERARY.—June 12th.—For the supply of four 6-ton end-tipping wagons, for the county council.—County Surveyor, Court House, Nenagh.

The Surveyor

And Municipal and County Engineer.

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Minutes of Proceedings.

The Cleaning and Life of Water Mains.

The true engineer should differ from the amateur engineer in the fact that he is dealing with a wider outlook. The knowledge of the amateur being limited, though sometimes quite correct and exact, is apt to lead him to erroneous conclusions, and the danger of his possessing control or deciding matters of engineering policy is sufficiently obvious. The engineer is only too often hampered by being obliged to give attention to the suggestions, recommendations, and instructions of his council, board of directors or clients, in matters of which they may possess limited and knowledge, but, nevertheless, knowledge of a character so limited that it produces a distortion of view that is most harmful. This distortion of view is, moreover, sometimes possessed by engineers who, being impressed by the merits of a certain system or line of policy, become advocates and special pleaders for that system, ignoring the fact that other methods or lines of policy have merits which make them applicable under certain conditions. To advocate main scraping in all cases would be the act of a person of incomplete knowledge, valuable as the process has proved itself in many districts. It is essential that the engineer should be entirely unprejudiced, and that having studied all possible methods he shall be able to judge each case on its merits. The tendency to reduce engineering work to a system has its application to the work of the manufacturer rather than to that of the civil engineer, and one ought not to expect the same breadth of view from the manufacturer as from the civil engineer. The manufacturer having produced a certain thing is naturally chiefly concerned with its sale. He naturally wishes to put forward his appliances wherever they will meet requirements; he certainly cannot be expected to advise the installation of appliances made by somebody else, and still less should he be expected to suggest some method by which the installation of plant is rendered unnecessary.

The cleaning of water mains is a case in point. Scraping appliances are being used with increasing frequency—sometimes wisely and sometimes unwisely. The incrustation and clogging of mains is due to many causes, and though in some cases scraping will be attended with the most beneficial results, in others there is risk and practical certainty of trouble. For instance, if the water is of such a quality as to corrode the mains the removal of iron rust and nodules will leave the surface exposed to further corrosion, which will not only lead again to the rapid incrustation of the interior surface, but will ultimately lead to the failure of the main. If such a main is cleaned it would be well for the engineer to remember at the same time that it is possible to treat corrosive water so that it will no longer attack the iron pipe. Or, again, with a hard water depositing lime in the main, scraping will give the main its lost capacity, but it will not prevent future trouble from incrustation. Here, again, the engineer would do well to consider the desirability of adopting some treatment which will prevent the deposition of lime. It is entirely wrong to imagine that there is any one and simple method by which the water engineer may get rid of water main troubles: the practice of the water engineer cannot be reduced to a system. What will be of the greatest value in one case may be absolutely useless in another. As an example, the double dipping of pipes for coating may be very valuable when the water is corrosive, and it may, under certain conditions, be better to rely upon efficient coating of the pipes than upon treatment of the water: but of what use is double dipping in Angus Smith's solution, or of any coating where the pipes are rapidly coated with lime owing to the quality of the water? It is sheer waste of money.

The paper which we publish elsewhere in these pages, entitled "Pressure-scraping of 15 miles of Water Mains," by Mr. James Macfadzean, the assistant burgh engineer at Ayr, deals with the subject in the broad-minded manner which is to be desired, and, moreover, the reading of the paper was followed by a discussion worthy of the subject. A great deal of very valuable information and evidence is given, which indicates the manner in which the practice of main scraping is being adopted in this country, but the author is very emphatic in stating that "each supply has its own problem, which must be treated by itself, and for whose proper solution the chemist should be associated with the engineer." This is the true spirit in which the modern engineer should work, and it is incontestible that the fullest general and technical knowledge, combined with the highest scientific ability, are required if our new pipe lines are to be laid and dealt with in the most economical and satisfactory manner, and if the existing pipe lines are to be satisfactorily and economically maintained. Loss of capacity can be restored, and clogging and incrustation prevented, and the metal of the pipes preserved if each problem is dealt with properly on its own merits; but in

considering the various possibilities, the possibilities of water treatment, of main cleaning, of protective coating and quality of metal are but a few of the considerations upon which practice should be based.

* * *

Town Planning in Scotland.

At the recent meeting of the Institution of Municipal and County Engineers at Ayr the president paid a well-deserved tribute to the excellence of the paper on "Suggested Town Planning Details for Scottish Conditions," contributed by Mr. John Bryce, M.INST.C.E., of the Glasgow Office of Public Works. The paper was really the outcome of the author's conviction that the Scottish Local Government Board are not likely to exercise the power which they possess under the Act of 1909 of prescribing a set of general provisions for dealing with the matters set out in the fourth schedule of the Act. This omission is not referred to by way of criticism, for until the experience of the actual working of some schemes has been obtained, it would be practically impossible to evolve provisions which would be applicable to various classes of area; but pending the issue of regulations, local authorities will have to formulate provisions for themselves—a task which will be considerably facilitated by a perusal of Mr. Bryce's paper. Dealing in the first place with the minimum width of subsidiary roads, Mr. Bryce pointed out that one of the advantages claimed by the operation of the Housing and Town Planning Act is that it enables authorities to make arrangements with proprietors for the provision of a system of open spaces and wide building lines by bargaining in connection with the cost of road construction. It is necessary, however, that this bargaining should be kept within well-defined limits, for if open spaces and wide building lines are secured as a set-off against narrow and cheaply constructed roads, and without regard to present and probable future traffic requirements, much unnecessary expense will be incurred in time to come. In connection with the width to be allowed between building lines, Mr. Bryce submitted a series of sections showing the amount of sunlight available for varying widths and heights of buildings in streets running east and west. In view of the acknowledged beneficial effect of sunlight on health, it is not surprising to find that this suggestion for widening out the building lines in order to get as much sun as possible was generally endorsed by those who took part in the discussion. Mr. Holmes, of Govan, went a step further, and suggested that builders of tenement houses, especially on northern exposures, should be required to adopt oriel windows for the same purpose. Such windows would serve the double purpose of increasing the amount of available sunshine and breaking an otherwise monotonous elevation.

Mr. Bryce afterwards discussed the minimum percentage for open spaces in dwelling-house areas, and we are quite in agreement with him in taking population as a basis and in advocating recreation grounds of adequate size wherever practicable in preference to a number of ½-acre open spaces dotted about an extensive area. The prevalence of tenement houses in Scotland renders the next point dealt with—namely, the maximum height and character of dwelling-house buildings—of particular importance in that country. There has been a long-standing demand for the abolition as soon as possible of the Scottish system of building long rows of high tenements, every facility for the erection of which is at present afforded by the building laws. It is felt that at least the four-storey tenement should be abolished, and that the extreme height of this class of building should not exceed three storeys. Finally, the paper dealt with the important question of the maximum number of dwelling-houses per acre for various classes of buildings. Having regard to the fact that one of the principal aims of the Housing and Town Planning Act is to reduce as far as possible the number of dwelling-houses which should be built on one acre of ground, the principles on which the maxima are fixed are of vital consequence. Mr. Bryce lays down the following rules as a basis: (1) One-roomed tenements should be abolished, and two-roomed tenements discouraged; (2) tenement houses, if erected, should not exceed three storeys in height; (3) the width between building lines should be not less than suggested in the earlier part of the paper; (4) widths of open space in rear and heights of ceilings should be fixed by statute; and (5) an open space of not less than 2 acres should, if possible, be arranged for every 500 houses.

It was an excellent idea to circulate the paper among the members of the Town Planning Committee for the Scottish District in time for them to make considered contributions to the discussion in writing. These contributions, no less than the paper itself, and the oral discussion, form a valuable addition to the common stock of knowledge in regard to one of the most important questions with which the municipal engineer of the future must be prepared to deal.

* * *

Heavy Traffic.—(II.)

In continuation of our remarks last week on the report on heavy traffic prepared at the instance of the County Councils Association, we now propose to examine that part of the document which deals with the amount and distribution of the weight of vehicles. The surveyors consulted are practically unanimous as to the desirability of a greater restriction of weight and of a better distribution of the axle weights. One states that the assumption in the covering letter of the Local Government Board of December 28, 1904, accompanying the Heavy Motor-car Order, that two-thirds of the total weight may generally be assumed to be upon the back axle, is not correct, as the weighing of a number of these vehicles has proved it to be about three-fourths. Another suggests that damage would be considerably decreased if the maximum unit of axle weight were reduced to at least the unit allowed under the Locomotive Act, 1878.

The question of overhanging loads was put to the counties, but there does not seem to be much complaint as to this. Lancashire, however, state that they are frequent, and should be prohibited by law. Leicestershire consider that loads should not be permitted to project beyond the sides of the vehicle. Northants find that, while not frequent, the width and height of loads is sometimes excessive, and consider that a maximum width and height ought to be fixed. Denbighshire point out that chars-à-banc habitually overhang the wheels. Glamorgan consider that the total width should not be allowed to exceed the width of a traction engine. There is no doubt whatever that even the weights allowed at present are very largely exceeded, and, owing to the lack of weighbridges and the difficulty of bringing the cars to those which do exist, there is practically no check upon them. Few local authorities attempt to do more than test their weight when they are registered. In most counties the councils have not at present decided to face the great expense of providing themselves with weighbridges for the purpose of checking weights, and no others appear to be available. The association suggest that a registering authority should have power to weigh any car on any available weighing machine, and this would, of course, apply to railway weighbridges.

Seldom, it seems, have the local authorities been able to recover damages for the injury done

by heavy motors under the head of "extraordinary traffic." It is a matter which is difficult of proof, and the expense of legal proceedings is a great deterrent, especially when the precise legal position is so uncertain as to render it always extremely doubtful whether the authority has a good case. In some instances, however, it has been possible to obtain some compensation by agreement, and the military authorities have also in several instances paid in respect of damage done. Parliamentary Committees are now showing a disposition to insist on clauses in railless traction bills providing for a contribution from the undertaking towards the cost of maintenance of the roads, and the same principle seems likely to be adopted in the case of motor bus companies which requires private bills. In the large majority of cases, however, in which motor omnibuses run over the county roads there are no means of obtaining any contribution from them in respect of the exceptional damage which they do both to the surface and the foundation of all roads, except those which have been specially reconstructed, and it is most strongly urged that funds should be raised from them which would go towards the extra cost of maintenance which they necessitate and also to pay a substantial share of the cost of reconstruction where that is required.

* * *

The Annual Meeting.

Members of the Institution of Municipal and County Engineers will hardly need to be reminded of the annual meeting which takes place on Thursday, Friday and Saturday next week. There is a formidable programme of papers covering a wide variety of subjects—so many indeed that it would appear to be difficult, if not impossible, adequately to discuss them within the very limited time available. The third day will, as usual, be devoted to visits to various works of interest. The first party will be entertained at lunch by the new president, and will proceed to inspect the Kingston sewage disposal works and Canbury Gardens; the second party will be conducted over the Southwark Bridge reconstruction works; while the third party will visit the new underground tube from the General Post Office to Paddington. No doubt many members will remain for the National Road Conference and Exhibition organised by the County Councils Association, which will open on the Friday afternoon, when an address will be delivered by the Right Hon. Walter Long, M.P., the new President of the Local Government Board. The conference will be continued daily from June 28th to July 1st for the discussion of several papers on highway subjects. As these meetings will witness the conclusion of Mr. Pickering's highly successful year of office as president of the institution, we feel that we shall only be fulfilling the wishes of our readers in congratulating him on the distinguished manner in which he has discharged his duties, and the institution on having been once again served so well. The new president is Mr. H. T. Wakelam, the county engineer of Middlesex. Mr. Wakelam's qualifications, both personal and professional, for his new dignity are so well known that it is unnecessary to say more than that members of all grades entrust him with the reins with the fullest confidence that he will more than maintain the high traditions of the institution.

Sanitary Conveniences in Shops.

As is well known, the Government are appealing to shopkeepers to set free all their male staff of enlistable age who are medically fit for service, but it is found in many cases—particularly in small shops where female labour has not as yet been employed and cannot be entirely substituted for male labour—that there is not available on the premises separate sanitary accommodation for the two sexes as required by the Public Health Acts, and it will obviously in such cases involve some hardship to the employer if, having already undergone a measure of sacrifice in releasing his male assistants, he is called upon to incur expense by way of structural alterations to meet conditions which are only intended to be temporary. The requirements of the Acts cannot, of course, be dispensed with, but the Local Government Board believe that in a very large number of cases it will be found possible to meet the difficulty by some temporary arrangement, such as the use, free of charge, of a convenience in a neighbouring house, or of a public convenience near by, which will secure the objects in view without involving the employer in serious additional expense. The board are informed that, in the case of factories and workshops where the same problem has arisen, arrangements of the kind mentioned have been adopted, with the consent or concurrence of the inspector of factories, and have proved quite satisfactory. The board therefore suggest in a circular issued on Monday that councils should instruct their officers to ascertain whether temporary arrangements of the kind indicated can be made in any case in which this difficulty is likely to arise, and generally to administer these provisions, so far as it lies with them, with the view of facilitating the action of any shopkeeper who is willing to allow his male assistants to join the Army. It is pointed out, however, that each case will require to be considered on its merits before a notice is served on an employer, and that, further, it should be made clear to the employer, in each case where temporary outside provision is made, that in the event of his continuing to employ persons of both sexes after the period of the war, he may be called upon to provide the separate accommodation in some more immediately accessible form.

Ripon City Engineer's War Allowance.

A question of good faith which has arisen at the Ripon City Council has, fortunately for the reputation of the corporation, been decided in the only right and proper manner—namely, by the resolve to stand by the bargain made with the city engineer. Still, the fact that the bargain or promise has been called into question is unfortunate, more particularly as it affects the amount of the allowance granted to Mr. Barlow when he joined the Army. We gather from a statement by Alderman Thirlwoy that when the city engineer decided to serve his country in the field it was agreed that half his salary should be paid to him, and that his position should be kept open for him. Most people will agree with the alderman that "it would be dishonourable to withdraw from that." Some there were, however, who appeared to be so indifferent to the city council's honour that they raised the matter in committee, with the result, as appears from a report of the proceedings, that it was resolved not to make any alteration in the allowance. Nothing daunted, they initiated a discussion, at the council meeting, when the report, arguing upon the basis of Mr. Barlow's Army allowance, suggested that they should reduce the amount granted to him to £40. It is common knowledge that the allowance made to an officer cannot be regarded as a financial asset capable of yielding a realisable surplus, and this being so the mayor was hardly justified in asserting that Mr. Barlow's position was bettered by joining the Army. Even if it were, it was neither kind nor encouraging to suggest that it should be made use of to justify the city council in breaking faith with Mr. Barlow. Happily, the members, by a majority of nine to four, refused to have anything to do with such a proposal.

Sydney Ocean Outfall Sewer.

(By a Correspondent.)

A few months hence will witness the completion in Sydney of the largest sewerage undertaking yet attempted in Australia. About five years have already been spent upon the scheme, and when it is finally completed £500,000 will have been spent upon it. The work in question is known as the Southern and Western Suburbs Ocean Outfall Sewer. This sewer will provide for discharging by gravitation into the Pacific Ocean, near Long Bay, the sewage from the southern, western and Illawarra suburbs of Sydney, together with that from a large tract of land, including Botany, lying between Cook's River and the ocean, and south of Coogee.

At the present time practically all the sewage from the above districts is treated at the Botany sewage farm, which is situated on the south side of Cook's River, where the latter enters Botany Bay. This sewage farm, originally determined upon for the purpose of dealing with the southern sewerage system of Sydney, and in 1898 extended to allow of the sewage of the Western suburbs being treated there, has an area of 620 acres, and the system of disposing of the sewage is partly by irrigation and partly by intermittent downward filtration. It is intended that this farm shall be abolished in its entirety when the works now under construction are completed.

The total area dealt with by this new sewer is 38,142 acres, with a population estimated in 1907 at 193,820, and a prospective population of 902,890 persons. The sewer has a total length of 6¼ miles, exclusive of the branch to connect with the existing screening chamber for the sewage from the southern suburbs, and provides for a discharging capacity of 210 cusecs, with a depth of flow of 5 ft. 5 in. at the outfall end. The section varies from 11 ft. 4½ in. by 5 ft. 9 in. to 12 ft. 3 in. by 9 ft., with vertical side walls and slopes 1 in 3½ on the bottom, corners at the junction of the bottom and side walls being rounded off. Concrete, plain or reinforced, has been used throughout, the mixture mostly employed being as follows: Bluestone metal and shivers, measured together, 16 cub. ft. to 8 cub. ft. of sand to 375 lb. of cement, the metal and shivers being mixed in the proportion of 3 parts of 2-in. metal to 2 parts of ¾-in. shivers before gauging. Generally speaking, one gauging was found to give 19½ cub. ft. in situ.

The grade is 1 in 3,650 throughout, and the average flow velocity in feet per second is calculated at 2·21, with a maximum flow of 2·53 ft. per second.

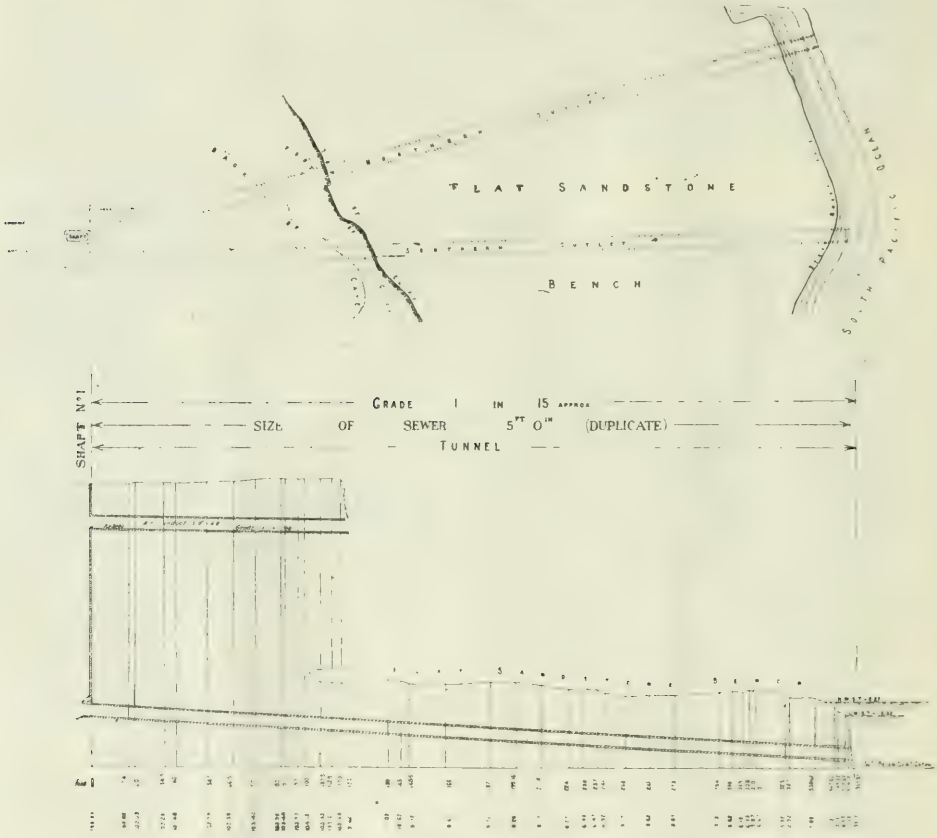

Fig. 1.—Sydney Ocean Outfall.

The sewer has been constructed partly in aqueduct and embankment, partly in open trench, and partly in tunnel through sandstone, and for convenience of the workings was divided into three sections respectively. Section No. 1—the outfall end—was mostly tunnelling through sandstone; section No. 2 was deep trench excavation through water-bearing sand, and section No. 3 was trench excavation, aqueduct and syphon under Cook's River.

Regarding the outfall, advantage was taken of the conformation of the ocean bottom to design the ocean outfall at such a depth below the surface that waves, during an ordinary storm, would not cause interruption to the flow of the sewage. This outfall is subject to the influence only of waves of oscillation, owing to its discharge from a vertical cliff with deep water in front of it (Fig. 1.) This sea cliff is 42 ft. deep, and practically vertical, the top being at the high-water level of spring tide, and the base 37 ft. below the level of

low water. The bottom, for at least ¼ mile seawards, is composed of large rough boulders, swept by the prevailing southerly current, and has a mean depth of about 100 ft. About 250 ft. back from the sea cliff is a land cliff 95 ft. high. This is of hard sandstone, dipping south 70 deg., west about 2 deg., and presents a bold escarpment to the east. Situated some 100 ft. from the land cliff a ventilating shaft was sunk to a depth of 100 ft., at the bottom of which was constructed the outfall chamber. This chamber is 24 ft. in height, 30 ft. wide at its widest part, and 32 ft. in length in the line of the sewer. The size of the main sewer as it enters this chamber is 12 ft. 3 in. wide at springing level, and 7 ft. 6 in. high from invert to soffit. From this chamber the outfall pipes, two in number, are each 5 ft. in diameter, with falls of 1 in 14·41 and 1 in 12·36 respectively, and the ends are splayed out in the form of a V about 90 ft. apart. The object of spreading out the outfalls is that a wave striking the rock would be less apt to cause a simultaneous pulsation in the two branches of the outfall than if adjacent to each other and on parallel lines. Both these outfalls were driven in the dry, and with regard to the southern outfall, pilot holes were kept well ahead of the working face, and the connection with the ocean was made last year. The soffits of the outfalls are 20 ft. below high water of spring tides. The invert level of the chamber is 2 ft. 6 in. below high water of spring tides.

Fig 3 shows an access shaft and chamber which is directly connected with the southern outfall culvert, and being 60 ft. back from the sea cliff. The superstructure is formed of 6-ft. diameter cast-iron cylinders, and is 20 ft. above the rock level. At the time this shaft was constructed it was contemplated that a diver would be able to utilise it for the purpose of making an examination of the outfall face after final blasting; but, on account of the very large up-and-down movement of water in the shaft, even on a calm day, the idea was not practicable. Indeed, on one day the movement exceeded 30 ft., whereas in the outfall chamber, 350 ft. back, there was absolutely no tidal movement.

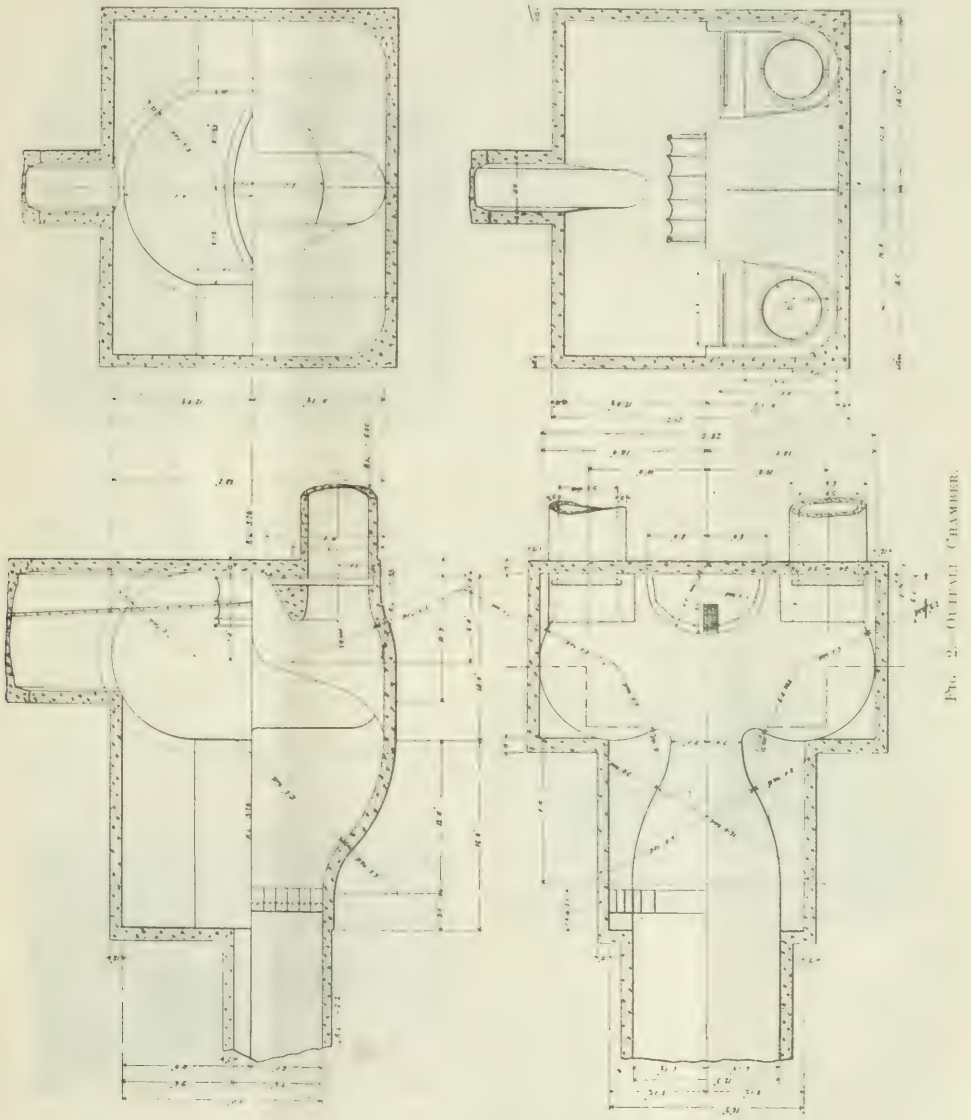

FIG. 2.—OUTFALL CHAMBER.

Fig. 4 shows the gantry for lowering the cylinders, &c., over the face of the cliff.

Fig. 5 shows one cutting from which over 60,000 cub. yds. were removed, and Fig. 6 is a general view of Long Bay.

The work of tunnelling through the sandstone rock—over 2 miles—was done partly by machine and partly

by hand. With regard to the rate of progress in the various drives, experience proved that driving through soft sandstone rock and shale could be done rather quicker by hand than by machine. But in very hard rock, working two shifts, by using machines, the progress was 13 ft. lineal as against 8 ft. lineal by hand in one face. In each face there were two miners for hand work and four miners for machine work. When working two shifts the general average driving per

Fig. 3. Access Shaft.

week in one face having a sectional area of 102 sq. ft. was 10 lin. ft. This was equivalent to 2·5 lin. ft. each miner per week of thirty-six hours with 9·4 cub. yds. Generally there were three truckers working in each face.

Nine shafts, each 12 ft. by 6 ft., were sunk, and varied in depth from 38 ft. to 133 ft. respectively. The cost of sinking through rock was 34s. per cube yard. The longest tunnel drive was 1,586 ft. The cost of excavation in tunnel through the rock, for labour only, averaged 25s. per cubic yard, and the cost for explosives 1s. 7d. per cubic yard removed. The average cost of complete work in tunnel averaged £10 10s. per lineal foot. The machines used were jack-hammers and poppers manufactured by the Ingersoll Rand

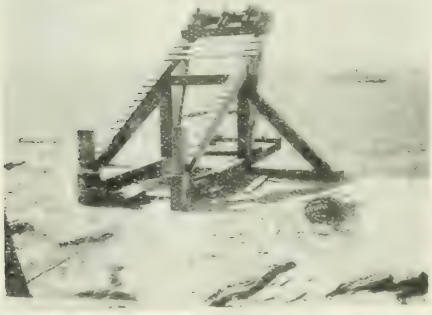

Fig. 4. Gantry for Lowering Cylinders over Face of Cliff.

[illegible] water jet was used with each machine. This consisted of a [illegible] with a special nozzle.

Electrical power was installed the full length, and was used for pumping, hoisting, air compressing, cranes, concrete mixing, and lighting. This power was supplied by the Sydney City Council, and the charge for power was 1½d. per unit.

Several self-contained "Eureka" continuous concrete mixers, driven by benzine engines, were used for mixing concrete, and they were found to be economical and satisfactory.

The length of the second section was 9,420 ft., and the construction was in trench principally through sand, the lower portion of which was very wet, necessitating considerable and continuous pumping operations. The depth ranged from 14 ft. to 60 ft. below the surface. To a height of 30 ft. above the bottom the excavation was taken out with vertical sides; above that level the excavation had sides cut to a batter of two horizontal to one vertical, sloping to a 10-ft. berm on either side of the vertical trench. In the shallow trenches the ground was held with ordinary timber runners, but in the deep trench steel interlocking piles were used. These piles were obtained from the Carnegie Steel Company, and were 12 in. wide, 40 ft. long, and weighed 40 lb. per lineal foot. A travelling gantry, 52 ft. high, equipped with a 2-ton Arnott pneumatic hammer, was constructed for driving the sheet piling, and two water jets were used, one at the back and one in front of each pile. Walings were suspended from the top of the steel piling, and struts placed as required. The sewer in this particular section was heavily reinforced.

The length of the third section was 12,038 ft., and

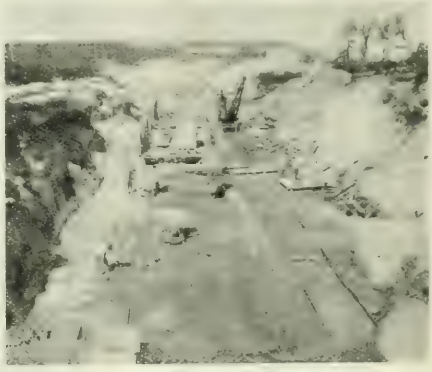

Fig. 5. A Cutting.

included construction both in trench and aqueduct, and also a syphon under Cook's River.

The aqueducts consist of reinforced-concrete arches of 50-ft. span, carrying the sewer; these also have expansion joints at suitable positions. The foundations for abutments, where not on rock, are carried on a piled foundation. At each end of the aqueduct, where the sewer is out of the ground, a foundation in the sand is formed a short distance below the surface with reinforced concrete, and cross-walls carry the sewer.

The syphon under Cook's River—two 4-ft. culverts—is designed with such a fall between its inlet and

Fig. 6. General View of Long Bay

outlet as will give a velocity of over 5 ft. per second when discharging at its full capacity.

The internal dimensions of the sewer on this section are 11 ft. 2 in. by 6 ft. from the end of section to the river, and 11 ft. 4½ in. by 5 ft. 3 in. from the river to the present terminal of the main western sewer. In shallow trench under roadways a heavy concrete section, with covering of I-girders and jack arches, has been adopted.

The whole of the works described are being carried out by the Government on the day-labour system, under the direction of Mr. E. M. de Burgh, M.Inst.C.E.

The engineer responsible for the design was the late Mr. L. A. B. Wade, M.INST.C.E., and the resident engineer in charge of construction for the ocean outfall end up to February last was Mr. H. E. Bellamy, A.M.I.M.E.C.E. That this scheme is urgently required is admitted by all, because Sydney is progressing and expanding at such a rate that there is every likelihood of the metropolitan population reaching 1,000,000 souls in the very near future. Then, again, the tremendous

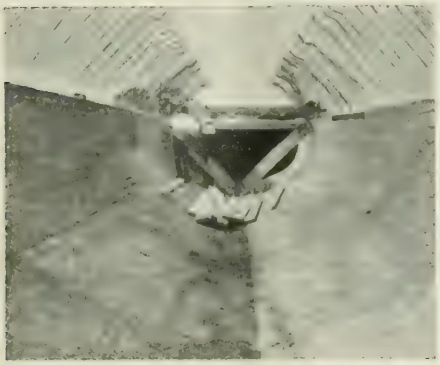

FIG. 7. SECTION OF SEWER, SHOWING ROCK REINFORCEMENT.

growth in all suburbs and the increased value in property is surprising. For instance, for the year ending December 31, 1911, for Sydney and suburban municipalities, the "improved capital value" of properties was £122,101,152; the unimproved capital value was £90,981,644, and the assessed annual value was £7,024,593.

Before concluding, the writer might draw attention to another important sewerage scheme which has also been under construction for the past twelve months, with Mr. H. E. Bellamy as resident engineer-in-charge. This scheme is known as the Vaucluse works, and will have deep ocean outfalls on the lines of the ocean outfall sewer. On this line, however, there will be some deep shafts, the ocean outfall chamber shaft being no less than 264 ft., and sunk through the solid sandstone.

The Maintenance of Flint Roads. With reference to a complaint that dust was swept into the middle of the roads, the county surveyor of Norfolk, Mr. T. H. B. Heslop, pointed out recently that, unless dust and grit were constantly swept over the surface, flint roads broke up. A flint road could not possibly be kept together in a dry season unless it was constantly kept covered with grit or stuff from the sides. This was the most economical way of preventing the roads from breaking up, and without such treatment in a few days a flint road would entirely disintegrate. It was mentioned that at Wymondham gummy silt taken from the pits was used, and this was more effective than dry dust. Mr. Heslop said that he entirely agreed, but that the expense was prohibitive.

Town Planning in Rural Districts. In a paper on this subject presented at the annual meeting of the Rural District Councils Association last week in London, Mr. W. B. Pindar, clerk to the Hunslet Rural District Council, remarked that the obstacles to the preparation of satisfactory town-planning schemes were fewer in rural districts than in urban districts and boroughs. A scheme might be made as regards any land which was in course of development or appeared likely to be used for building purposes; and wherever there was a scarcity of houses, or a demand for the provision of new houses, either by the local authority or by private enterprise, they had a primâ facie case for the preparation of a town-planning scheme. Apart from such a scheme, there was absolutely no power in the hands of the district council to control the lines on which their area might be developed. The cost of preparation of a scheme was not very great, and the preparation was a work which might appropriately be carried on at the present time, when so many other works were held in abeyance. In the discussion, Mr. S. Adams (Auckland) said he considered that town planning was applicable to only a very few rural districts.

CO-OPERATION IN TOWN PLANNING SCHEMES.

The following communication has been addressed to members of the Institution of Municipal and County Engineers by the secretary, Mr. J. W. Dudley Robinson.

"The councils of the Surveyors' Institution and the Institution of Municipal and County Engineers desire jointly to direct the attention of members of the two bodies to the advantages to be obtained through co-operation between surveyors acting for public authorities and those representing private interests, where town planning schemes are under contemplation.

"It is now generally agreed that the welfare of the community demands not only that all classes should live in sanitary, healthy and well-built houses, but also that the environment of their dwellings should be sanitary, healthy and attractive.

"The Housing, Town Planning, &c., Act, 1909, provides the necessary machinery for this object, and the councils have had under consideration the means by which this machinery may best be made to work smoothly. To secure this they are of opinion that the most important matter is to reconcile the various interests affected, and that this would most effectively be done by conferences being held between the officers of the local authorities on the one hand and the advisers of land and property owners on the other, in the earliest stages of the preparation of town planning schemes. At such conferences suggested schemes should be considered on broad lines, and particular attention should be paid to

"(1) Arterial roads for through traffic;

"(2) Estate streets (*a*) communicating streets, (*b*) subsidiary streets for estate traffic only;

"(3) Restrictions to density of building and character of buildings (domestic factories, &c.), and

"(4) Defining building lines on existing and proposed streets.

"These conferences,* which could be quite informal, and might often take the shape of individual interviews, should take place freely in the initial and subsequent stages of the preparation of a scheme, so that, as far as possible, there may be agreement on the main principles before the final Local Government Board inquiry takes place.

"The adoption of such a course would prove advantageous to landowners in that objections against a scheme having been met, or desired amendments obtained, by mutual concession and discussion before the scheme had taken a definite shape, there would be few alterations to be made at the date of the application for approval of the scheme by the Local Government Board. Opposition being thus met before the more advanced steps were taken, the time employed in passing a scheme through the various stages would be reduced to a minimum, and the period during which development could only proceed slowly and cautiously owing to uncertainty as to the shape a scheme would finally take, would be correspondingly reduced.

"The course suggested would also prove advantageous to the officers of local authorities, as their work in preparing and obtaining approval in respect of schemes would be considerably lessened, and the possibility of future friction in carrying out their provisions would be greatly eliminated.

"In order to meet the difficulty, which may be advanced by surveyors representing private interests, that they are unable in all cases to obtain information concerning proposed schemes, and in order to facilitate the work of the officers of local authorities engaged in the preparation of schemes, particularly as to the book of reference, the councils of the two institutions have arranged that, if the officers of local authorities will notify the secretary of the Institution of Municipal and County Engineers when they are about to prepare schemes, he will supply the secretary of the Surveyors' Institution with the necessary information for communication to members of that body likely to be concerned, so that such respective members may get in touch with each other.

"In conclusion, the councils of both institutions desire to impress upon members the undoubted benefits, both present and future, which may be anticipated from a concerted effort to secure that future centres of population shall be laid out with wisdom and prescience, and they venture to express a hope that members of all branches of the profession may do what is in their power, by co-operation and goodwill, to advance this desirable purpose."

* In some cases these are required by the Procedure Regulations.

Institution of Municipal and County Engineers.

MEETING AT MATLOCK.

The final meeting of the Institution of Municipal and County Engineers prior to the annual meeting in London next week took place at Matlock on Saturday last. For the East Midland District the number present was distinctly small, but this was doubtless due, in great measure, to the unavoidable delay attending the issue of the programme, and must not be taken in any way to reflect on the capacity of the hon. district secretary, Mr. Crump, who—as usual—exerted himself strenuously to make the gathering a success. For various reasons the customary paper was not forthcoming, but in its place the members

Mr. Joseph Turner.

Surveyor and Waterworks Engineer to the Matlock Urban District Council.

were privileged to hear a most interesting address by Dr. Bemrose, of Derby, on the geology and mineral waters of Matlock. The sewage disposal works, which are under construction—a joint scheme for the Matlock and Matlock Bath urban districts, the Cromford portion of the Bakewell rural district and the Dethick Lea and Holloway portion of the Belper rural district—were inspected in the course of the afternoon, and an entirely successful meeting was brought to a close by a visit to Messrs. Smedley's famous hydropathic establishment.

When the meeting opened at the town hall there were present: Messrs. N. Alker (Chorley), W. Burn (Sutton-in-Ashfield), C. Clews (Derby), E. H. Crump (Hinckley, hon. district secretary), S. Clare (Sleaford), R. Cordon (Driffield), F. Dean (Eccles), T. Fenn (Belper), J. C. Haller (Nottinghamshire), J. W. Horton (Derbyshire), W. Jaffrey (Matlock), F. Langley (Buxton), W. Mitchell (Buxton), W. Meteyard (Ashbourne), J. S. Pickering (Cheltenham, president), A. J. Ross (Lutterworth), W. Stubbs (Blackburn), S. Turner (Ashby-de-la-Zouch), and A. H. Walker (Loughborough), members; Dr. Bemrose (Derby), Messrs. F. Baxter (Matlock), J. Diggle (Westminster), S. Diggle (Westminster), W. Loades (Derby), J. Lamb (Nottingham), J. Nuttall (Matlock), W. Smith (Matlock), D. Hurd (Matlock), J. Turner (Matlock), D. M. Wildgoose (Matlock), J. W. Wildgoose (Matlock), and J. G. Wildgoose (Matlock), visitors. Apologies for non-attendance were received from Messrs. H. Coales (Market Harborough), F. P. Cook (Mansfield Woodhouse), G. Hawley (Basford), T. Henry (East Retford), F. Hopkinson (Worksop), E. Jeeves (Melton Mowbray), T. Lake (Bourne), E. G. Mawbey (Leicester), S. Maylan (Basford), A. Parker (Oakham), W. Purser (Kesteven), V. Smith (Chesterfield), and H. G. Whyatt (Grimsby).

The Chairman of the District Council (Mr. D. M. Wildgoose, J.P.), in welcoming the members, said that, although only a comparatively small community, Matlock was fully alive to the importance of being up to date in all matters pertaining to its comfort and well-being. His view was that they could not know too much in these days. In particular they realised [illegible] and it was hoped that a result of the sewage scheme [illegible] they had embarked would be that the health of the town—never bad—would be better than ever.

The President (Mr. J. S. Pickering), in acknowledgment, remarked that, while the institution very frequently had under discussion great engineering works occupying the attention of the large cities and towns, they realised the advantage of occasionally visiting smaller towns, as they knew that their undertakings, although not of the same magnitude, were none the less interesting. Indeed, the smaller communities had difficulties which required just as much thought and consideration as the problems which had to be tackled by the larger populations, the only difference being that they had not the same resources at their command. It was not a small matter for townships such as Matlock to secure for itself an adequate and pure water supply, to provide for drainage and sewage disposal, to arrange for the collection and sanitary disposal of refuse, and to meet the modern requirements with regard to the roads. Those and similar important matters seemed to have been successfully dealt with at Matlock; otherwise it would have been impossible for the town to have retained the reputation for which it was famous as one of the leading health and pleasure resorts of the country. Visits such as that were interesting to them all, but particularly to those, like himself, from towns of a residential character, where the main object was to cater for the wants of the holiday-maker, and those seeking quiet surroundings in order to recruit their health. They would be privileged that day to see how Matlock was providing for its visitors, and, by the kindness of the engineer to the scheme, Mr. Diggle, they would also be afforded an opportunity of inspecting the sewage works that were in course of construction. Sewage disposal was a subject in which they they were all interested, and it would give them pleasure to see how the particular problems that confronted Matlock were being dealt with. The facilities the institution afforded its members for improving their knowledge could scarcely be overestimated, for meetings such as that not only benefited the members themselves, but the towns which they represented. Local authorities were coming to recognise the good work the institution was doing, and were, he was pleased to say, giving greater encouragement to officials to attend meetings, and in Matlock he felt they had another town which was in sympathy with their objects. He thanked the chairman of the district council for the very kind remarks he had made, and hoped the visit would be as advantageous to the town as it would be to those who were attending that meeting.

The minutes of the last district meeting—held at Loughborough on April 10th last—having been read and confirmed, the president called upon Dr. Bemrose, of Derby, to give his promised address on

MATLOCK GEOLOGY AND MINERAL WATERS.

Dr. Bemrose said he might say that the position he held as chairman of the Derby Waterworks Committee and vice-chairman of the Derwent Water Board did not qualify him to talk about local water supplies, and therefore he was going to avoid that subject. He was rather fond of inspecting the geological strata of the county, and whenever he saw a scheme carried out, such as the Matlock sewage scheme, which involved excavations, he liked to go down the ladder and see the rocks through which they were passing. He was asked at short notice to give them some information about local geology; but, thinking the matter over, and looking it over with Mr. Clews, he thought if he said something about the Derbyshire basalt used for road metal it would be more practical. Their district secretary, Mr. Crump, suggested that he should say something about the mineral waters of the district. It was quite obvious that he could not go into the whole geology of the district, but he would give them a simple key. That building was situate on the upper beds of the mountain limestone series in Derbyshire; then there were shales, and then limestone, or nodules of limestone. If they looked straight in front of them they would see a hill of mountain limestone. If they went from the station to Darley Dale they would see some very large limestone quarries. If they looked up Matlock bank, about Smedley's Hydro, they would see some

[illegible] and then they came to the millstone grit. The millstone grit was used for building purposes. The limestone was burnt in a lime kiln and made a road very dusty in summer and greasy in winter. There was a road in the neighbourhood which he heard a man describe as pasty; but the paste on that road might very well be turned into some kind of [illegible].

VOLCANIC ROCK.

What was interesting in the mountain limestone of Derbyshire was the volcanic rock in it. They had volcanoes in Derbyshire while the mountain limestone was being formed, and he could take them to a place 6 miles away from there where there were vents into the volcanic tuffs. The rock was formed by the fragments being thrown up from the bottom of the volcano and settling down on the land bottom or the sea bottom. They also found there were two lava streams, which were quite distinct from those in other parts of the district. In one part of the district they were divided by 150 ft. of limestone—there they were divided by 80 ft. of limestone. They would see one in the beginning of the tunnel between Matlock and Matlock Bath. The sewage scheme had been through the igneous rock or lava or toad stone, and they would have to go through it [illegible] as the crow flies to Matlock Bath to Matlock.

UNSUITABLE ROAD METAL.

They got first of all the tuffs, which were fairly friable; nobody would use them for road material. Put a little acid on the stone, and it dissolved very easily. It was light in weight, and had a specific gravity of 2·5 or 2·6. Then they had the lava streams. He had got specimens there of the lower lava of that part of Derbyshire. They would notice some small white specks in it. Those white specks at once condemned it as a road metal. It effervesced when treated with acid, and would not make a good road metal. The specific gravity of that probably came up to 2·7. Those white patches were once some of the holes in the hot lava, and had since been filled up with carbonate of lime. They had the minute fragments which were thrown down and formed the tuffs, and then they had the hot streams of lava which formed over miles of the country. They did not count anything in age of 100 ft. of limestone. They were either formed on land or floated along a shallow stream. But in either case they had suffered from weather, and had been suffering ever since. The water could get down to them, and rock them very rotten indeed before the quarryman came to them. Here was another specimen which looked very good, but it effervesced a good deal when tested by acid. That he should condemn as a road metal. He had two other specimens, very much heavier; one came from the Bonsil sill. After the mountain limestone had been formed, and the millstone grit had been formed, for many years the volcanic action of Derbyshire had not died out.

INTRUSIVE ROCK.

Some of the millstone rock ejected itself in weak places, and then began to spread itself. In two cases in the district it came up to the level of the lower lava. That rock came up when there were some thousands of feet above it and crystallised. It was that kind of rock which geologists classed as intrusive rock, and which should make a good road metal. He was not saying it was the best road metal, but he would say that if they selected the best places from the quarries they should get a good road metal; but if the man supplied some of the lava with it he should send it back to him. They would not select any stone which was light, or which dissolved or effervesced with acid; but if they did they would not use it again, for it came from the lava streams. It was rather dull in appearance, and had no crystals in it. When they came to the intrusives they had crystals in them and grit, and something which would withstand the weather.

Dr. Bemrose then explained some photographs of the various rocks in the neighbourhood, and pointed out those with crystals in them. They might, he said, go into one quarry where they got a good rock, and found specimens of stone which were fresh all through, and they might go into another quarry where the stone was badly weathered, soft, and light in weight. There were only two sets of intrusive stuff in the district. They wanted to know the place of origin, and they wanted to test the stone with acid. If the specific gravity was anything like 3 it was good rock, but if it was anything like 2·5 or 2·7 they should reject it. If the crystals glistened in it very much they would get a good metal.

MINERAL WATERS.

Now as to the mineral water. It had rather an interesting history. There were originally two springs. There was a warm spring, 68 deg. in temperature, found in the seventeenth century. Now there were three springs. The first discovered spring was near the Royal Hotel. The water attracted people, and they built a hotel, and the place which they called the old Bath. People used to come and drink the water and take the bath. The second spring was discovered on the spot which was now called the new Bath Hotel. The hotel had a swimming bath under one of the rooms of the hotel. That bath was covered by a vaulted roof made of stone. The third bath was discovered at the Fountain, but the water was not warm. They suspected that that water somewhere in its course found a cold stream, which mixed with it. They traced its course, found the cold stream, separated the two streams, and got a water at the temperature of 68 deg. Those waters contained a good deal of carbonate of lime, and as they flowed into the air various articles were put into the water, and they were encrusted with that carbonate of lime and petrified. The water had been analysed by Dupre, and was found to contain—

	Grains per gallon.
Chloride of sodium	1·57
Sulphate of magnesium	3·73
Sulphate of calcium ...	2·01
Carbonate of calcium .	11·68
Silicas	0·71
	31·73
Traces of alum	1·03
Total solids	32·76

These were the only three underground streams, though it was believed there were a great number in Derbyshire. It was estimated by a commission, forty or fifty years ago, that between the High Tor at Matlock Bath and the mills at Masson-road—the brick mills—every twenty-four hours 21,000,000 gallons of water came out of the base of the hills and flowed into the river—practically underground water, —supplying the river at one point or the other. These three springs probably produced at the most 1,000,000 gallons per day.

Mr. J. W. HORTON (Derbyshire) said that, while Dr. Bemrose had referred to many tests, he had not referred to the only test which was worthy of consideration—that of the test upon the road. When they applied that test, no matter what they might expect from a quarry, they did not get it. In Derbyshire basalts they would find a very great variation in quality. The result was that, while Dr. Bemrose might advise them to make their selection, they could not do so; they were in the hands of those who exploited these quarries, not in the interests of bad stone, but because they had to take it as it came, and they had to run the risk of getting both bad and good—perhaps he ought to say both good and bad. Unfortunately, in Derbyshire there had been a good many disappointments in the development of basalt quarries. He had worked one basalt quarry and got very good stone indeed; but one met with such varied kinds of material. They would get perhaps one huge boulder that would be good, and then they went a little further and they came to an immense amount of rubbish. He knew one quarry which was worked extensively, and after months of trial had to be closed down because the owners found, after a heavy expenditure on plant, they got more rubbish than good stone. They could not depend on getting good stone, and so there were immense opportunities for losing money. He was still using basalt, and possibly the Derbyshire County Council were using more basalt than anyone else, but he had not found any basalt which would compare in real value with good granite where the price was the same. Of course, if they were buying basalt at half the price they had got a margin; but if he had to pay the same price as for granite, unquestionably he would put his money into

granite. He did not know that Dr. Bemrose would say that the stone he had shown them would equal basalt from Clee Hill. There was some good stone to be got occasionally from Derbyshire, but they could not rely upon uniformity of quality. He was obliged to Dr. Bemrose for his hints as to how to test the quality of stone, but if he would tell them, when a truck of 10 tons of stone arrived, how to pick out the good from the many thousands of pieces, they would owe him a still greater debt of gratitude.

The President (Mr. J. S. Pickering) said that probably Dr. Bemrose was treading upon rather delicate ground there in condemning in a wholesale manner the use of limestone. If it went from the meeting that the stone from the limestone quarries was unsuitable for road metal, their meeting would not be so popular as it was when they began their proceedings. The remarks of Dr. Bemrose required a little qualifying. He had noticed the fearful amount of dust on the roads, and he did not think that ought to be so in the days of motor-car traffic. He thought the reason was limestone was not put to the best use. He had experience with limestone somewhat similar to the limestone of Derbyshire. At one time it was used in roads of water-bound construction. That was abandoned for very good reasons, and Clee Hill basalt, of which they had heard Mr. Orton speak, was substituted. To show the change in road construction, the Clee Hill basalt had almost been abandoned for the use of tarred limestone. But he would like to add that the tarred limestone was only used as a crust. It was laid down 3 in. or 4 in. in thickness, and on the top was laid a coat of tarred granite in order to take the wear. He thought if some system of that kind could be used in Derbyshire districts, in which limestone was used to a large extent, this difficulty of the dust would be entirely obliterated. His own experience was that tarred limestone made an excellent road, far better than a water-bound basalt road, or any other water-bound construction, and, having a tarred granite topping, was almost entirely free from dust. He had a number of roads laid in the method described. These had been down for six years, with a fair amount of traffic, whereas the same roads with water-bound construction only lasted three years. Their life had been more than doubled, they were still in good condition, and they were kept in good condition by tar-spraying, gritting with ¼-in. granite chippings, and steam rolling each year. They did not want to create an impression that limestone was not a suitable material. His own experience was exactly the contrary; if it was used properly it was an excellent material; but used as it was in that district, he thought it was not to be desired. There was a note with regard to the mineral waters. He would like to ask Dr. Bemrose the geological formation from which the mineral waters were derived, and why they got their characteristics as mineral waters. That was a matter he had often considered, and he was sure from Dr. Bemrose's knowledge he would give them some information on these points. As a geologist, could Dr. Bemrose go to other unexplored parts of the country and point out where mineral water springs were likely to be found, or was their appearance due to a freak of Nature? In Cheltenham they had a number of these mineral water springs, but nobody seemed to know where they came from. He moved a vote of thanks to Dr. Bemrose for his address.

Mr. W. Jaffrey (Matlock), who seconded, remarked that limestone in its raw and natural state was not a suitable material for road making, but applied in the form described by Mr. Pickering it would be a suitable material. In Matlock they got limestone at about 2s. per ton, instead of 9s. or 10s. per ton for other stone, and they naturally clung to the local material. His experience of basalt was the same as Mr. Horton's. There was good basalt, but also bad, and time after time they would find among the basalt weathered stone, which was no good.

The vote of thanks was passed.

Dr. Bemrose, in reply, said he was very glad his remarks had provoked discussion. Apparently it might seem that Mr. Horton was in disagreement with him, but the material which they in Derbyshire called basalt was not basalt; geologically speaking, it was dolorite. They had only one basalt in Derbyshire —that was Calton Hill—and it might be mistaken for a German basalt, for it was as good as those on the Rhine. The origin of the mineral waters must be rather deep, for they seemed to keep an even temperature. There were a number of hot springs which were not generally known. Generally, he presumed, the appearance of these springs was due to a fault in the strata which enabled them to come up.

MATLOCK SEWERAGE AND SEWAGE DISPOSAL.

Following luncheon at the Crown Hotel, the President announced that Mr. James Diggle, of the firm of James Diggle & Son, Westminster, the engineers of the above works, had been good enough to offer a few remarks with regard to the undertaking prior to the afternoon inspection, and he was sure the members would be indebted to him for the information.

The scheme, as outlined in a brief descriptive pamphlet circulated among the members, provides for the disposal of the sewage of the urban districts of Matlock and Matlock Bath, the Cromford portion of the Bakewell rural district, and the Dethick Lea and Holloway portion of the Belper rural district. Mr. Diggle said that before he was consulted by the council it had been found impossible to decide as to whether a joint or a separate system was the more desirable, and after he came into the matter five years were spent in inducing the several authorities concerned to throw in their lot with Matlock. The view he took of it was that in a district of that kind, famous as a health resort, it would have been an act of vandalism to have put down sewage works all over the valley, and he thought, when they had inspected the undertaking, they would agree that the sites he had chosen for the tanks and filtration beds could not be improved upon. Unfortunately, owing to the war, the works were still unfinished; had it not been for that they would have been able to see them that day in a completed state, and when they were completed he would be happy to show them to them again. He had aimed at a gravitation scheme, and just succeeded, the flattest gradient being 1 in 782. They had a good deal of low-lying ground alongside the river, but they got over the necessity for pumping by installing Adams' lifts—the cost of which was £5,400. In the course of their operations they had had to undertake a great deal of tunnelling, and had come across plenty of water, in addition to which they had had to provide for five river crossings, the cost of which was £3,360. The cost of the whole scheme was, he was sorry to say, very heavy. The total length of the main outfall sewers was 5 miles, and alongside the river they were obliged to use iron pipes because they were below the river. There were river walls which had to be constructed owing to the steepness of the valley, and the bridges added to the cost of the river crossings. Owing to the inability of the first contractor to complete the scheme after some £8,000 worth of work had been put in, they were obliged to call for fresh tenders, and were now—as a result of the initial experiences—paying 50 per cent more as compared with the original tender—which was for £38,722. He could not tell them exactly what the cost would be, but he thought they might take it that, after receiving the contributions of the various authorities, the amount would be substantially £60,000, including land, easements, contingencies and engineers' fees.

The President said he would like to take the opportunity of thanking Mr. Diggle for his interesting remarks, which he was sure would prove of value to them when they made their inspection of the undertaking.

SEWAGE WORKS.

The works, which will provide for a population of 13,000, and a dry-weather flow of 360,000 gallons per day, will occupy 16½ acres of land, divided as follows: Site of works, 5½ acres; filtration plots, 10 acres. There will be two screening chambers, each 11ft. 6 in. long, 4 ft. 6 in. wide, and 2 ft. 6 in. deep. The detritus tanks will be four in number, each 18 ft. long, 11 ft. wide, and 3 ft. deep; total contents 14,850 gallons. All sewage up to six times the dry-weather flow will pass through the detritus tanks. There will be four sedimentation tanks, each 80 ft. 9 in. long, 30 ft. 9 in. wide, and about 6 ft. deep; total contents, 360,000 gallons. The percolating filters will be eight in number, and of the circular type, each 70-ft. diameter, with brick walls, 2 ft. 9 in. high, and clinker walls above. The filtering medium will consist of destructor clinker, broken to pass through a screen of 1½-in. mesh and retained on a ⅜-in. mesh, except the bottom portion which will be broken to pass through a screen of 4-in. mesh. The depth of medium will be 5 ft. 5 in., and the cubical contents 5,500 yds. The "Simplex" distributors have been adopted.

The humus tanks will be two in number, each

[illegible] 6 in. long, 21 ft. wide, and from 2½ ft. to 5 ft. deep, total contents 82,000 gallons. There will be [illegible] filtration plots. The land is of a porous character. The supply pipe will be 21-in. diameter, and crosses the river Derwent by means of a syphon.

The engine-house, 30 ft. long by 22 ft. wide, will contain two 10-horse power oil engines for the lifting of sludge—the lift from the well to the bed will be 24½ ft. The sludge well will be constructed under the engine-house, and will consist of cast-iron tubbing, 10-ft. diameter and 17 ft. deep. The sludge beds will be four in number, each 40 ft. 9 in. long, 14 ft. wide, and 2 ft. deep. An area of [illegible] has been provided for storm water area.

SEWERAGE.

The main outfall sewer will be of 24-in. diameter earthenware and cast-iron pipes; other sewers will be from 6 in. to 21 in. in diameter. The total length of sewers will be 12 miles.

Storm overflows will be two in number, and there will be four automatic flushing tanks of from 1,500 to 2,500 gallons capacity.

The river Derwent crossings spoken of by Mr. Diggle will consist of three lattice-girder bridges, 80-ft. span, with footways 4 ft. 3 in. to 6 ft. 6 in. wide; one bow-string girder bridge, 9-ft. span, and one river crossing (below river bed).

The two Adams' lifts will be situated at Matlock Green and Hall Laithes respectively, and have capacities of 11,250 and 8,000 gallons, the nett height of lift in feet being 11¾ and 17¼.

As stated, on returning from the sewage works—where additional details of the undertaking were given by Mr. Stanley Diggle—the members proceeded to Smedley's hydropathic establishment, where, following the inspection, they were entertained to tea by the directors. On the proposition of the president, votes of thanks were accorded to the urban district council for their reception of the institution, to the directors of Messrs. Smedley for their hospitality, to Messrs. Diggle & Son for their information regarding the sewage scheme, and to Messrs. Jaffrey and Turner for their share in the arrangement of the meeting.

The proceedings then terminated.

SCOTTISH DISTRICT MEETING AT AYR.—(*Conclusion*)

The paper discussed at the recent Scottish District meeting of the Institution of Municipal and County Engineers at Ayr was the following:—

SUGGESTED TOWN PLANNING DETAILS FOR SCOTTISH CONDITIONS.

E. Jones Bryce, M.Inst.C.E.
Office of Public Works, Glasgow.

[Mr. Bryce served his articles from 1877-1882 with Messrs. A. & W. Black, who were acting at that time as consulting engineers to the burghs of Falkirk and Grangemouth. From 1882 until 1890 he was an assistant with Messrs. Kyle, Dennison & Frew, Glasgow, and before severing his connection with the firm was promoted to the position of principal assistant over a large staff, and was responsible for the carrying through of many important street, drainage, and water works. In 1896 he was appointed by the city engineer of Glasgow as special assistant in connection with the carrying out of the Glasgow main drainage scheme, and three years later became burgh engineer and master of works at Partick. His transfer to the Glasgow Office of Public Works took place in 1912.]

The Scottish Local Government Board have issued procedure regulations for regulating generally the procedure with respect to the preparation or adoption and the approval of town planning schemes, but as yet they have not issued any set of general provisions dealing with the matters particularly referred to in the fourth schedule of the Act. It may be that the board have no intention of doing this, and that they will decide on the merits of each scheme as it is submitted. Local authorities will therefore have to formulate provisions themselves, and especially on such matters as widths of roads, height and character of buildings, provision of open spaces, and the limitation of the number of houses per acre.

It is hardly necessary to point out that, owing to the difference between the English and Scottish methods of building development, it is essential that some general principles should be arrived at in view of the preparation and impending approval of the first town planning schemes in Scotland.

The provision of the existing statutes applicable to Scottish cities and burghs will have an important bearing in arriving at reasonably sound principles for town planning development.

It is recognised that town planning is an attempt to get away from cast-iron regulations and statutes; but, however desirable this may be, the fact remains that too drastic and extravagant propositions which are away from the spirit of the ruling statutes will lead to schemes more or less abortive, and will expose local authorities to many difficulties, financial and legal. . . .

Among the chief features requiring to be fixed in any town planning scheme are:—

(1) The minimum width of subsidiary roads.
(2) The minimum percentages for open spaces in dwelling-house areas.
(3) The maximum height and character of dwelling-house buildings.
(4) The maximum number of dwelling-houses per acre for various classes of buildings.

Each of these features will be considered in the following notes, which are submitted for the purpose of criticism, and, if possible, arriving at some general principles for both urban and rural areas. . . .

THE MINIMUM WIDTH OF SUBSIDIARY ROADS.

On the question of the minimum width of subsidiary roads, it will be observed that in the Dunfermline scheme roads are proposed as narrow as 20 ft., including footways where the carriageway is 13 ft. wide, and the length does not exceed 350 ft. Such streets are to be provided with one turning space near the centre.

It appears to me that for modern conditions it would be better to have the carriageway of a road, even in the quietest of areas, wide enough to allow two vehicles to pass each other. This would require a minimum width of 18 ft. for carriageway, and, with footpaths of a minimum width of 5 ft., would fix the total minimum width of the street at 28 ft.

Such a width would be a great difference from statutory widths, and the difference in cost in a complete system of subsidiary roads would form a suitable basis for negotiations in regard to the provision of open spaces and wide building lines.

The foregoing proposals are only suggested for rural areas, where there is to be an open type of development like the Dunfermline scheme. In the case of an area to be developed in a more urban district, say, where tenements of from two to four stories are proposed to be erected, the increased population and traffic would require that the minimum width of such subsidiary roads should be increased in the carriageway to 24 ft., and in the footpaths to 8 ft., giving a total width of 40 ft. between the parapets.

Building Lines.—It is a generally accepted principle in schemes of open development that the building lines of subsidiary roads should not be less than 70 ft.

apart. In the case of roads where tenements of dwelling-houses are proposed to be erected an endeavour should always be made to fix minimum building lines at 80 ft. apart in the case of two-story tenements, 90 ft. apart in the case of three-story tenements, and 100 ft. apart in the case of four-story tenements, especially where these are running east and west. . . .

The ground floors of three-story tenements on the north side of streets with building lines 60 ft. apart are without sunlight for four months in the year, and in the case of four-story tenements under like conditions the absence of sunlight from the street-floor houses covers a period of about five months. To widen out the building lines as suggested has an appreciable effect in the possible increase of sunlight. The ground-floor houses of three-story tenements on the north side of a street with building lines 90 ft. apart would be without sunlight at noonday for about two months as against four months for building lines 60 ft. apart. And in the case of similar houses in four-story tenements 100 ft. apart the absence of sunlight would be reduced from five months to three months. In the case of streets running north and south there is not the same necessity for widening out, owing to the fact of the sunlight having access to both sides of the street for some hours each day at any time of the year.

The beneficial effect of sunlight upon the health of the human being is a matter of general knowledge, and modern medical authorities insist so strongly upon the necessity of sufficient solar light reaching the dwelling-houses of the people that every available opportunity should be seized by town planning engineers to provide for this.

With reference to tree-planting in streets where tenement blocks are to be erected, it is questionable whether this should be done. In any case it is never advisable unless the building lines are fixed at the increased widths suggested.

THE MINIMUM PERCENTAGE FOR OPEN SPACES IN DWELLING-HOUSE AREAS.

An open space, which should provide facilities for a certain amount of recreation, should be not less than from 1 to 2 acres in extent (say, an average of 2 acres), measuring to the centre of the surrounding streets, and it would seem to be much more practical to provide these on some definite principle than to have small areas of little real value at close intervals.

In the case of areas restricted to less than, say, fifteen houses per acre, open spaces are not required so frequently, as each house has its own garden. In the case of various closer types of urban development, separate open spaces should be provided and arranged on some recognised principle. Population, and not area, should be the guiding factor in endeavouring to fix the areas required for such spaces. . .

It is not suggested that these small local open spaces should supersede the necessity for arranging larger areas or "playing fields" for adults at one or two places in a large scheme. The 2-acre spaces would secure an open and ornamental character of development for urban conditions, and at the same time provide suitable recreation places for young children, and should be arranged, if possible, on the principle that they will increase considerably the value of the houses fronting or adjacent to the open spaces.

THE MAXIMUM HEIGHT AND CHARACTER OF DWELLING-HOUSE BUILDINGS.

It is clear that, on this question of height, there is a unanimous opinion that, wherever possible, four-story tenements should be abolished, and that the extreme height of this class of building should not exceed three stories. . . .

With reference to the "character" of buildings, the opportunity given in town planning schemes to abolish "corner" tenements should be taken advantage of, as also the erection of single-apartment houses. It should also be provided, as far as possible, that every dwelling-house in a tenement should have through ventilation—from front to back.

THE MAXIMUM NUMBER OF DWELLING-HOUSES PER ACRE FOR VARIOUS CLASSES OF BUILDINGS.

There are abundant precedents to guide the engineer in determining and regulating the distribution of buildings where the open style of development is to be adopted all through. The difficulty arises in schemes adjacent to large towns and cities, and bordering on closely built-up areas. Such schemes will require to provide for the limiting of the number of houses per acre on a grading principle from a reasonable allowance for four-story tenements down to the cottage type. . . .

On a matter of this kind, where the maximum has to be fixed, it may be accepted that, as two-apartment houses should be discouraged as far as possible, and every facility be given for the erection of three and four apartment houses, an average between two and four apartment houses—viz., a three-apartment house—might safely be adopted as the standard for limiting the number of houses per acre, and these would be as follows: For two-story tenements, twenty-six houses per acre; for three-story tenements, thirty-three houses per acre; for four-story tenements, thirty-seven houses per acre.

[In an appendix to Mr. Bryce's paper is given a summary of the chief points in the proposed town planning scheme for the burgh of Dunfermline, this being followed by various criticisms by members of the Town Planning Committee of the Scottish District.]

DISCUSSION OF MR. BRYCE'S PAPER.

Mr. J. Young (Ayr) said, as a humble student on this subject, he had been very much impressed with the many side lines there were to be considered. It was not a subject which could be looked into in a superficial manner at all; it was one they must sit down to and think out in detail. The paper all through was built up on a comparison of the open and closed type of development in town planning. He thought Mr. Bryce was very wise in doing that, because for the first time, he thought, under the Town Planning Act was revealed the actual difficulties that there were in close development under town planning schemes. Under the open development schemes, or in rural districts, they had not the same difficulties, and they could there develop more on the English principle where the buildings were low and a small number to the acre. It was a very much more difficult matter to town plan for three or four story tenements than it was to design for cottages, varying from an average of eight houses to the acre up to a scheme in which perhaps there might be twenty to twenty-four houses to the acre. The difficulties that emerged seemed to be three—the appropriate size of the land unit; the proportion of density on that land unit; and the proper percentage of open spaces to be set apart in that land unit. It seemed to him, taking first the land unit, that, apart from the arbitrary limit, there might in schemes be natural limits to the boundary. It depended on the character of the district. They might have a small area which in its configuration was undulating in character, which might be limited, say, to the top of a rise in the ground where it might be necessary to have roads round about at the lower level. They might take that, and make that land the unit, and develop it under those three heads of density, proportion and open space percentage. That could only be done in fixing the size of those land units on paper on the plan that was being developed. Mention had been made of an arbitrary land unit of 5 acres, split up into squares. He thought that was absolutely useless. He was entirely at one with Mr. Bryce in thinking that the Ruislip-Northwood scheme was of no value at all in determining the density proportion of houses built for that land unit. The paper was particularly valuable in pointing out to them, he thought for the first time, the importance of sunlight for public streets and dwellings in those streets. He agreed that it was very advisable to develop streets running north and south as much as possible; but he thought in the provision of schemes there ought to be some clause which would not allow the taking away of the benefits of the sunlight, even in streets running north and south, and that all extreme projections in the way of outbuildings should be prohibited on account of the blanketing of the sunlight on rooms on the ground floor. They could well see, if a villa 35ft. or 40 ft. deep, had also a wing, anything from 20 ft. to 25 ft. deep, that that wing, if two stories high, would effectually exclude the sunlight in the west room when the sun was shining from the south, even if the streets were running north and south. Therefore he thought it very advisable in the provisions under the scheme that projections from the rear of buildings should be very strictly looked after. Another point in reference to sunlight which he did not see recognised in the paper was the proximity of separate dwelling houses to each other. They had a street running north and south under ideal conditions, but they had houses built within 4 ft. of the boundary, and the next house built within 4 ft. of the boundary, only leaving a space of 8 ft. or so

between the houses. Any windows on the sides of those houses would, of course, be blanketed for sunlight, so he thought it advisable that there should be [illegible] as to the width of houses on the sites, as well as keeping back the main frontage lines.

Mr. J. THOMSON (Dundee) said it occurred to him that there was no necessity at all for the so-called land unit, and the 5-acre unit, suggested in the South, would never suit Scottish conditions. In Dundee it happened that they were negotiating with very friendly landowners, few in number, and as far as division into particular units was concerned, he thought they would be able to arrange with them that new physical and existing boundaries would be most appropriate for laying out these points in a way that was in accordance with the Town Planning Act. On the point as to the blanketing of sunlight, if there was any accommodation, such as wash-houses or closets, it should be at the side. In the South it was placed in the backyard, but that would never satisfy Scottish requirements. In regard to the attempt to standardise matters of construction, they might discuss such matters until doomsday, but they could depend on it that every district would have its own views. They could, however, agree as to the width of streets. They must in any case have room for two vehicles to pass and a reasonable width of footways, and he thought 30 ft. was more like the figure than 20 ft. Another point with regard to these roads was that in many cases they provided for planting trees. He passed down a beautifully wooded street on his way to that hall, the trees growing in the gardens of the houses; but there were no trees planted in the street itself. If there had been trees planted in that street it would have been spoilt. So every borough engineer would have to arrange for tree planting as they had done in Ayr, where they had not planted trees if there were gardens in front of the houses. The street to which he had referred was an old street, and the trees were well grown.

Mr. P. C. SMITH (Dunfermline) said he hoped in anything he had to say as to the Dunfermline town planning scheme they would not take it he was an authority on the matter. It was only a few months ago since he became connected with Dunfermline and its town planning scheme. It might be useful to give some particulars and remove some misunderstandings. As regarded the width of arterial roads, they all knew that in provincial towns, if they had to buy up land and pay compensation for the making of wide arterial roads, then town planning schemes would be unworkable for towns of 30,000 or 40,000 people. In Dunfermline they approached the owners at the beginning on this question of land as a matter of give and take. The landowners were men of sufficient business capacity to see the wisdom of giving land for wider arterial roads. In all cases the land had been given free to the corporation, and in most cases the landowners had undertaken the expense of forming 40 ft. of the 100 ft. roadway. Thus the owners were paying two-fifths of the cost and the town the other three-fifths of the cost of making these 100-ft. roads. He thought that was a very good bargain for the town. Coming to the secondary roads, the landowners had seen that it would be to their advantage to give wide roads in opening up cross-communication on the estate. They arranged to get roads of from 60 ft. to 80 ft. In every case the land had been given free, and the landowner made 40 ft. of the roadway. Mr. Bryce had referred to a 20-ft. roadway in Dunfermline. He might explain that there was only one road of that width, and it was a road which, according to the contour, could never be built upon other than on one side. Then Mr. Bryce had spoken of a 7-ft. road which had to be widened up to 12 ft. That 12 ft. of roadway was sufficient to allow the baker's cart, the butcher's cart, and the coal cart to the front of those houses. He did not know whether it was Mr. Bryce who spoke of introducing a narrow lane at the back of the houses. He was against that. It was going to add to the cost of development, and bring a charge upon the landowner and the feuer, which would make cheap houses impossible. Having what they called in Scotland a close between every two houses, to adopt a further entrance to the backs of these properties would largely add to their cost. The other point was the minimum space of land area and the land unit. Mr. Young, in his criticism, said that the land unit and the open spaces and density hung very much upon one another. He thought they would find in their town planning schemes the dense units would be those in near proximity to public works, and there they required larger open spaces. As Mr. Thomson had said, it was for each individual area to consider and determine the merits of its own scheme rather than to fix any hard-and-fast rule. Coming to the height of buildings, this was another point which had given rise to some misconception. In the height of domestic buildings were included those tenement buildings 60 ft. high, with two stories built in the roof. But in the ordinary dwelling-house there was to be only one story built in the roof, and that was to form part of the house below, and not be a separate house by itself. Therefore he thought the story in the roof would never be built. A man who could afford to build a house with a story in the roof could afford to build a cottage; so he thought there would be no demand for these houses with a story in the roof. As to tenement buildings, that, he thought, was a matter which every town planner must consider in relation to his own district. The circumstances in Dunfermline were entirely different from what Mr. Thomson found in Dundee, or Mr. Bryce in Glasgow, or Mr. Young in Ayr. The four-story tenement, which they would all like to get rid of, they might have to allow. He thought their aim should be to make the three-story tenement the maximum height, and go on from that to the two-story tenement, and then on the cottage development. There seemed to be a dead set against the one-story house, and the story in the roof for private occupation, as compared with the complete house. That, again, was ruled by the economic conditions prevailing in the industrial centres. Take areas like Dundee, where they had a considerable number of single women living by themselves; those women said they could not afford to have a two-roomed house. In Arbroath they had a number of one-room dwellings. They could not lay down any hard-and-fast rule; every one of them must consider the matter in relation to their own individual circumstances.

Mr. W. ROSS YOUNG (Lanark County) said he was glad that this important subject of town planning was again being discussed at their conference. Indeed, it was a subject which had been discussed at most of the recent conferences dealing with municipalities. The need for having legislation for governing the growth of the populous areas had been much felt by all of them, and he thought when the Government passed the Housing and Town Planning Act of 1909 it did one of the greatest things to benefit social reform that the country had done for many, many years. They would all agree that the Acts they had had in the past—the Housing and Sanitary Acts—were merely palliatives to keep down disease and reduce the social evils arising from existing housing conditions. This Act, however, came to the root of the whole thing, and said, "Let us plan out our own towns before proceeding to erect them." Surely, if it was necessary for an architect to plan out a house before he erected it, it was more necessary to plan out the whole fabric of a city before it was erected. The Town Planning Act was a good measure. They had heard it criticised; he had heard it called weak and hardly applicable to Scotland. The Town Planning Act was a fair working Act, and with a thorough understanding of the provisions there should be no trouble in evolving schemes for the growth of their areas, which should produce towns and villages more magnificent than they had ever had before. They were all aware that this Town Planning Act could be applied to any land in course of development or likely to be used for the purposes of development. It further stated that they might include land which had already been built upon if that land was situate in regard to the land not built upon that it was advisable to take it in. That gave them great powers over towns where building was likely to take place. It also gave them power to obtain land for new roads. It said that they could take any ground required to make trunk roads. The Act really gave the local authorities power to include all the land that was necessary. Mr. Bryce's paper dealt more or less with what those provisions ought to be, and the conditions in framing those provisions. The conditions which had been introduced into town planning schemes were (1) those provisions which governed the width, direction and construction of the streets; (2) those provisions which governed the various zones or areas to be set aside for purposes of public works, houses, &c.; (3) those provisions which would limit the number of houses to be erected per acre; (4) those provisions which would limit the building line in streets; (5) those provisions which would govern the open spaces in future to serve the town; and, lastly, the provision

which would ensure the sanitary condition of the area to be maintained. Mr. Bryce had largely dealt with three of the factors—first, the width of streets; second, the number of houses to be erected per acre; and, third, he had dealt, to some extent, with building lines and space about buildings. The width of the streets must be graded according to the traffic they were to carry, and the number and class of buildings to be erected. In the past they had had to grade their pipes and sewers according to the work they had got to do, and why should they not grade the streets according to the work they had to do? Therefore, in future there should be no trouble in grading streets. As regarded the minimum width of streets, he was not going to find fault with Mr. Bryce. Make the width of the main streets as high as they could; but remember this, if they asked the landowner to give land for main streets of 100 ft. wide they must give him an advantage on the interior roads where cottages were built. Now as to the number of buildings per acre. They were all in favour of six or seven as the number which they would like to erect to the acre. He believed that was a matter which they must deal with on its own merits, and consider in relation to the circumstances. They were all agreed that the number of buildings to be erected in future must be considerably reduced; there must be an end put to this overcrowding. They must try to reduce the number from what it was now to about one-half. It was not an uncommon thing to have plans presented where a man attempted to erect 100 houses to the acre. That was ridiculous. As to the height of buildings, he agreed with Mr. Bryce that they should have the height reduced. Let the four-story tenement be reduced as soon as possible. Make any provision for three-story tenements as limited as possible. Get the buildings reduced to two stories as far as possible, and get a regulation as to get cottages instead of tenements. There was a difficulty in absolutely doing away with tenements. They must house the men fairly near their work, and that was against doing away with tenements altogether; but they should make provisions which would discourage tenements as far as possible. As regards sanitary provision, they in county areas would be greatly indebted to towns in that respect. They hoped in their schemes they had introduced provisions whereby they would secure for every house a water-closet, and a larder where they could keep meat and milk. With regard to the size of the house, he could not agree with Mr. Smith. He thought the day for the one-room house was going past. He agreed that there were some cases in which the one-room house was required; but the one-room house for the widow they often found occupied by a family of seven or eight. He thought the one-room house should be done away with.

Mr. J. Lee (Paisley) said this was the best contribution he had ever read on town planning. He agreed that it was no use having 20-ft. streets; no street should be of less width than 36 ft. There were a lot of ideas about having trees and grass verges, and only about 9 ft. of made roads in the centre. They all knew where it led to, and the condition into which the grass fell. It was far better to have the carriageway of the street properly formed, and properly maintain it. As regarded the single-room house, in the large towns the single-room houses were absolutely necessary. In his district single-room houses were always in demand for the old people and for girls. He was pleased that Mr. Bryce had condemned the four-story tenement. It would take some time to get rid of it, but the sooner builders realised that it was undesirable the sooner they would have it abolished.

The President said he would like to express the thanks of the members for the very valuable paper he had contributed. He quite agreed with Mr. Lee that this was one of the most important papers that had been submitted on the important subject of town planning. He thought the method which had been adopted of sending out this paper in advance to the Town Planning Committee was one to be very highly commended, as they had not only the opinion of the author, but the experience of others particularly interested in this subject, and who had had the time to go through the paper, and give them their views. He was sure they would agree in expressing their thanks to Mr. Bryce for his very able paper on this subject.

The vote of thanks having been passed,

Mr. Bryce thanked them very much for the way in which they had received the paper. The paper was only in the way of suggestions; he had not adopted the dogmatic tone in saying that it must be this or that, but had made it only by way of suggestion. He thought the day would come before long when local authorities, by conference with their officials, would arrive at some kind of definite proposals—a kind of model by-law idea for town planning. He hoped that day was not far distant, and it was in view of the possibility of that that this paper was written, because, as far as he could see, in all the literature on town planning there was nothing specially applicable to Scotland and Scottish conditions. Therefore it occurred to him at the Dunfermline meeting last year, and it was also impressed upon him at every conference, where the Scottish conditions were notorious by their absence, that it was high time something was done to lay down some kind of suggested principles for Scottish town planning, and if this effort had been of any value, he was very pleased that the meeting had suggested it. He had nothing to say in regard to any criticism because the criticisms, as far as he could see, were all sympathetic, and there was nothing to object to in any way.

PRESSURE-SCRAPING OF WATER MAINS.

The scraping of 15 miles of water mains was described in a paper by Mr. James Macfadzean, B.Sc., Assoc.M.Inst.C.E., the assistant burgh engineer of Ayr. The contribution is reproduced on p. 772 of this issue.

Dean of Guild Kirk (Coatbridge) said the data placed on record in the paper would be much appreciated. The Coatbridge and District Water Trust had been obliged to scrape a main for a length of 33 miles, and were compelled to put in hatch-boxes much in the same way as had been done at Ayr. The number of and distance between these was all regulated by

Mr. James Macfadzean, B.Sc., Assoc.M.Inst.C.E.
Assistant Burgh Engineer, Ayr.

Mr. Macfadzean was educated at Greenock Academy and Glasgow University. He was for two years in the works of Messrs. Glenfield & Kennedy, Ltd., Kilmarnock, and then served articles with Messrs. Nasmyth, Baird, civil engineers, Glasgow. After being about six years with this firm, he went to Canada, and was for two years in Western Canada in charge of the construction of various municipal works for Messrs. Galt & Smith, of Toronto. He came home, and, after being for nearly a year in the engineer's office of the Clyde Navigation Trust, he was appointed chief assistant to the burgh engineer and surveyor of Ayr about five and a-half years ago. Mr. Macfadzean graduated B.Sc. Engineering in 1906, and was elected an associate member of the Institution of Civil Engineers [illegible]

the contour of the line. He considered it was always desirable that the hatch-boxes should be enclosed in a brick chamber, for that helped to avoid trouble with the farmers, and greatly facilitated operations. Another point was that, in bringing a main up to ordinary conditions instead of including the cost of the hatch-boxes in the main scraping it should be put down to capital expenditure. They had experienced the difficulty of their scraper getting stuck; they had lost it and recovered it 1½ miles ahead. Their percentage of carrying capacity was not so much reduced as in the case of the pipes which had been referred to. The maximum flow of the main was expected to be 2,000,000 gallons, and a little more than twelve months afterwards they were carrying only 500,000 gallons less than the real maximum of the main. At Ayr they began the scraping at the smallest part of the main, but in his own case they put the scraper in at the measuring-house, and did the 18-in. main first. That gave them a greater hydraulic pres-

ance. They employed a Glenfield and Kennedy's scraper, and obtained most excellent results.

Mr. M. SELLARS (Dundalk) said that, as one with some experience of this work, he thought the subject of the paper was most interesting, and there was no other in which the municipal engineer learned more by trial and error. It was marvellous the number of things that could be brought out of a water main. He was not sure that the expense of the hatch-boxes could not be done away with; he thought too much money had been spent on these. At the present time he was scraping an 8-in. main for the first time after thirty-one years. He believed in a travelling valve, but as regarded putting a plug in the hatch-box his experience had been a sad one, the scraper driven it up into the hatch-box. He wanted to know why the smaller pipe referred to by the author was scraped first. By far the most important thing in the paper was the suggestion for the prevention of incrustation, and when Mr. Macfadzean mentioned double dipping he did a great service. It was one of the best points in the paper. In a paper he read some three or four years ago he stated that American writers were of opinion that it was economical to scrape mains so that the delivery was reduced to the level of the demand. The question was to know when to begin.

Mr. P. C. SMITH (Dunfermline) gave some information in regard to a 12-in. main which had been scraped regularly for the past twelve years. The main was divided into seven sections, with the hatch-boxes as nearly as possible equal distances apart, and enclosed in a brick chamber, so as to have a satisfactory drain into the stream. Consequently there was no question about surface damage to farmers and others in the operations. The scraping of the mains took two or three days. In April it took two days, the work being done on two days of the Spring holiday, so as to cause the least inconvenience to other works. They took up a portion of the main, and began operations by opening up the hatch-boxes as they went along. In order to get over the difficulty of the plug being driven into the main, his predecessor adopted a scoop which he placed in the pipe over the plug. It was quite a simple thing, and made a very convenient arrangement for getting the scraper out of the pipe. Another device that had been introduced by his predecessor in order to overcome the difficulty of the scraper sticking in the pipe was a fish cutter, and since that had been done the trouble had disappeared. He had also added a wire brush which seemed to increase the efficiency. The main was usually scraped in the month of October, but his predecessor advised him to get away from the winter scraping, and do the work in the month of April. He had found that with his October scraping he had increased the efficiency by 30 per cent. With the April scraping he put on another 17½ per cent, and he found, on examining the figures for the previous years, that that practically brought the main back to its original efficiency. The cost of scraping over the two days amounted to £27—or less than £2 a mile.

Mr. J. CULLEN (Stirling County) stated that in his case, where they had to scrape every three months, they had found great benefit from putting in brick chambers and reinforced-concrete covers, and drains from all their hatch-boxes.

Mr. J. LEE (Paisley) expressed the view that, instead of scraping a pipe every few months, it was better to take out the pipe altogether—especially after thirty years' service. Of course, there was not so much trouble experienced with delivery pipes as with the distributing pipes; but he should like to know if anyone present had had experience of the scraping of pipes of from 4 in. to 6 in. in diameter. He thought for small pipes the Power-Cleer system was very good. Mr. Smith had spoken of his main being scraped every year, and he would like to know whether that had any effect on the pipe. In his view it must. Mr. Cullen's case was worse; to scrape a pipe every three months would soon destroy it.

Mr. D. A. DONALD (Grangemouth) stated that he also had obtained very satisfactory results with the Power-Cleer machine. As to the question when it was not desirable to scrape a pipe, he thought Mr. Goudie could say something.

Mr. A. H. GOUDIE (Stirling) said they had a main which had been scraped before he went to the town; that was twenty years ago. Attempts were made to rescrape it, but the pipe was in such a condition that they had to give it up altogether; in spite of which, however, it was still in use, and doing efficient service. It was an 8-in. main. It was not giving the delivery it ought to, but during the seventeen years he had been in Stirling it had never varied in the amount of water it gave.

Mr. J. WADDELL (Burntisland) mentioned the case of a pipe which, when first scraped, had lost 22 per cent of its capacity. Its full carrying capacity was restored by the scraping. During the time it had been under his charge it had been scraped annually, and in every case the result had been the same. Every year the carrying capacity fell off 22 per cent, and the full carrying capacity was as regularly restored by the scraping.

The PRESIDENT (Mr. J. S. Pickering), in closing the discussion, remarked that, fortunately, water engineers generally did not have to deal with pipes requiring this scraping; but those who had would have obtained some very useful information from the paper and the discussion. Would the author, in replying, tell them how he managed to keep the town supply going on while the work was proceeding?

Mr. MACFADZEAN said he wished to thank those present most cordially for the way in which they had received his paper. He agreed entirely with Mr. Kirk that the cost of the water-boxes should be included in the capital cost, and that was the reason why the cost, leaving out hatch-boxes, &c., was worked out separately in the paper. Mention had been made of the number of articles found in pipes, but he thought their mains were well laid, and constructed under proper supervision, because they had discovered nothing of the kind in them, nor any badly-run joints. The question had been asked why the smaller pipe was scraped first. It was really a difficult point to decide which to do first, for if they scraped the smaller one first they lowered the pressure head where the main changed size. That could be remedied in a way by sending back the pressure by closing certain valves. On the other hand, if they had scraped the other main first, the pressure head would have risen where the main changed size, and as their relief mains were not in good order, they did not take the risk. With regard to the method of scraping by a travelling valve, it occurred to him that that was introducing needless expense, for then the main had to be cut every time scraping was undertaken. Mr. Lee had spoken of the scraping of smaller mains. They had, of course, gone in for that by means of the Power-Cleer machine. He had seen it stated that it was not advisable to scrape by means of pressure any mains of less diameter than 5 in. He did not think he would scrape one under 6 in. under water pressure unless there were an exceptionlly good head, and the decision to scrape a main of either 5 in. or 6 in. would depend on the incrustation. Each must decide for himself whether it was wise to scrape a main or not. Personally, he did not think it was wise to do it unless one was really "up against it," because the corrosion always became more rapid after the first scraping. They would now have to scrape every two or three years, and as the main had gone on for thirty years or so without scraping, possibly it might have been advisable to let it go on. But in that case they were "up against it," inasmuch as they had to supply water to the town, and the only alternative was a large capital expenditure.

VISITS.

At the close of the business proceedings in the county hall the members divided into two parties, one making visits of inspection to the refuse destructor, the electricity station, the hospital extension and the pavilion and esplanade, and the other going to Alloway to see Burns' monument and cottage—as was done on the occasion of the previous meeting of the institution at Ayr.

EXPERIMENTAL ROAD LENGTHS.

On the following morning the members proceeded on an inspection of the experimental stretches of road which have been laid outside the town, on the Ayr to Galston road. There are ten stretches, each 100 yds. in length, and of an average width of 19 ft. 6 in. The metal applied throughout was basalt rock from Hillhouse Quarry, machine-broken and screened to a uniform 2-in. stone, except in three cases. The sections are as follow:—

No. 1.—Ordinary macadam, as used in the district.

No. 2.—Ordinary macadam surface, tar-sprayed with distilled tar, Road Board No. 2, at the rate of 1 gallon to every 5 super. yds., the surface being gritted with ⅜-in. to ½-in. mesh chippings, 1 ton covering 120 super. yds.

No. 3.—The surface coated as before, dry-rolled, and grouted with pitch mixture consisting of 1 ton of pitch to 60 gallons of oil and sand. The pitch, after

being melted, was raised to a temperature of 300 deg. Fahr. Clean, sharp pit sand, heated on sand heaters to a temperature of 400 deg. Fahr., was mixed with the pitch and oil in a mixing vessel, in equal proportions, by measurement, of the heated pitch mixture and hot sand, and the mixture was kept continuously stirred in the boiler before being emptied from pouring cans on to the road to fill up the voids in the aggregate, and rolled immediately. The chippings—about 5 per cent—were applied before and during the rolling operations, the quantity of mixture required to grout the coating being about 1¾ gallons per square yard. The preparation and laying of this mixture, on account of the high temperatures and the want of special plant, made it very difficult to handle.

No. 4.—Similar to No. 3, except that there was no sand added to binder.

No. 5—Similar to No. 3, except that the grouting was composed of 1 part of Trinidad Epuré asphalt and 2 parts tar. The asphalt slowly melted and tar added. The grouting was well sprayed into the aggregate, and the surface immediately sprinkled with ½-in. whinstone chippings. No sealing coat was applied.

No. 6.—Surface coated with 3 in. of tar-macadam, composed of whinstone broken to the British Standard Specification for 1½-in. gauge, 11 gallons of tar, No. 2, being mixed with 1 ton of stone, and lightly rolled. The surface spread with 10 per cent of ¾-in. to ½-in. chippings, and sealed with No. 2 Road Board tar and gritted with ¼-in. whinstone chippings, rolled; 1 ton of chippings to 100 sq. yds.

No. 7.—Same as No. 6, except surface sealed with Trinidad Lake bitumen.

No. 8.—Same as No. 6, except surface sealed with Mexican bitumen. The sealing was composed of 90 per cent Fluxphalte and 10 per cent Mexphalte, heated, and applied by small Fluxphalte sprayer, then covered with ¼-in. chips, 1 ton covering 150 sq. yds.

No. 9.—Same as No. 5, except the matrix was mixed with the metal (similar to concrete), instead of being grouted into the voids of the new metal, a similar quantity of chips being used.

No. 10.—Rocmac. The Rocmac was mixed in the proportion of ½ cub. yd. of limestone and 5 gallons of Rocmac solution to 1 ton of metal, and turned over with the metal and spread 3 in. thick on road, and rolled and sprinkled with water until the Rocmac grouted the interstices of the metal.

The county road surveyor, Mr. Allan Stevenson, says it is interesting to compare results at present, but that, as the experiments are to be carefully watched, and the conditions of each noted every week, it is not practicable to arrive at a definite conclusion.

MINERS' COTTAGES.

Leaving the experimental road lengths, the visitors were conveyed to Glenburn, near the famous golfing town of Prestwick, where 186 flatted cottages for miners, designed by Mr. Allan Stevenson, the county road surveyor, have been erected by the firm of Wm. Baird & Co. for their employees. Baths and washhouses—a separate building—are a feature of the scheme, and the arrangement of the interior of these was examined with much interest. During the stay we gathered that the cost of a two-roomed cottage, with kitchen and scullery, was £245, and that of a cottage of one room, with kitchen and scullery, £190, this figure including roads and pavements, but not land. No attempt appears to have been made to provide gardens for the tenants of these by no means commodious dwellings, and this seems a matter for regret. Certainly there is ample open space around the cottages, but there are, doubtless, even among those engaged in the industry of mining, not a few who would appreciate the advantage of a plot of ground, however small, attached to their living places. As it is, fresh air and exercise are obtainable only in a sort of common playground, which, as the members of the institution saw it on the occasion of their visit, was not altogether pleasing to the eye.

HILLHOUSE QUARRY.

From Glenburn the visitors passed on to the Hillhouse Quarry, where, after a tour of the stone-crushing and tar-macadam mixing plants, blasting operations were carried out for their special benefit, large masses of the rock face being dislodged by the charges. In the neighbourhood of the quarry are some remarkably beautiful rock gardens, and by the courtesy of Mr. Baird Thorncroft these were thrown open to the inspection of the members.

At Troon the party were the guests of the quarry company at luncheon.

Later in the afternoon the members motored to Ness Glen, the journey being made by way of Patna and Dalmellington. A delightful walk to the head of the glen brought the party to Loch Doon, whence the return journey was commenced. A halt was made for tea at Dalmellington, and Ayr was reached again in the early evening.

MUNICIPAL COAL CONTRACTS.

QUESTION IN THE HOUSE.

On the 9th inst., in the House of Commons, the President of the Local Government Board was asked whether he was aware that the Glasgow Corporation, in their new coal contract, had been obliged to pay increased prices of from 60 per cent to 70 per cent; whether he would obtain information as to the prices at which the municipal authorities had renewed their coal contracts for this year; and whether, in view of the position being created for some of the vital municipal and industrial enterprises, he would endeavour to get enforced the main recommendations of the Departmental Committee on Retail Coal Prices.

Mr. Runciman, who replied, said that, as he had stated at various times, effect had already been given to the majority of the recommendations of the Departmental Committee, and he was in negotiation with colliery owners with reference to the pit-head prices of coal. He would consider the suggestion that information should be obtained with reference to the contract prices for coal paid by municipal authorities.

The Holidays Question.—In view of the probability that, owing to the conditions now prevailing, difficulty may be experienced in obtaining satisfactory substitutes, the Main Drainage Committee of the London County Council express the view that, in all cases where it is necessary, the services of the members of the staff under their direction should not be interrupted by summer holidays. All men, however, who are obliged to forego their holidays will receive additional amounts equal to their usual rates of pay.

Ashton-under-Lyne, Stalybridge and Dukinfield (District) Waterworks.—Mr. Fred J. Dixon, the engineer and manager of these works, has issued his report for 1914. The report is illustrated by photographs and diagrams graphically showing the rainfall, the conditions of storage, and the consumption of water, together with views of the Dukinfield and Knott Hill reservoirs, and Chew works, while in course of construction. The sources of supply consist of three gathering grounds situate in the Pennine Chain some 4 to 5 miles due east and north-east of the town of Ashton-under-Lyne, and the total volume of water delivered from the various reservoirs into supply, including the statutory obligations as to compensation water, is 1,741,282,272 gallons. The population supplied is estimated at 148,083, and the consumption per head per day last year was 20·77 gallons.

Appointments of Municipal Employees. The Surbiton Urban District Council have received from the Local Government Board a letter relative to their circular letter of March 11th, and the suggestions therein made for the provision by local authorities of all possible facilities to persons in their employ for joining the Army or finding employment in those occupations which are of paramount importance during the present war. The board reminded the council that in the letter it was pointed out that it would be necessary to economise labour to the greatest possible extent, and, where substitutes are needed, to engage only men who are not eligible for the Army or suited for the special occupations in question. The board accordingly now suggested that whenever vacancies occurred, and it was unlikely that candidates suitable for permanent appointment who were not eligible for the Army or for special work in connection with the war could be obtained, the local authority should consider first whether it would be possible by a rearrangement of duties among other officers to avoid any fresh appointment during the period of the war; and that if this should be found impracticable, they should endeavour to secure the services of any retired officer with the requisite experience who might be able and willing to act during that period. Failing this they should engage persons temporarily who are not eligible for the Army or the special occupations.

The Surveyor

And Municipal and County Engineer.

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Bungalows for Workmen.—At a meeting of the [illegible] Rural District Council [illegible] a report from a committee [illegible] dwellings was received [illegible] A member proposed that temporary buildings in the way of wooden bungalows should be erected, and it was resolved to ask the Local Government Board for sanction to provide dwellings of this type.

Acid Wastes in Sewers.—Mr. Shelley, chairman of the Walsall Sewage Farm Committee, on Monday made reference to the discharge into the public sewers of trade refuse. He said that the refuse was of such a nature that the new plant which had been installed at the purification works might have been ruined. It should be made clear to manufacturers that the council had drastic powers for dealing with people who made an unreasonable use of the public sewers. The opinion was expressed that, as there had been previous complaints as to the discharge of waste acid into the public sewers, the committee should take steps to ascertain the worst possible, and should institute proceedings.

Trade Refuse Removal Charges.—At their meeting on Wednesday the Chiswick Borough Council had before them a recommendation that in future the charge for the removal of trade refuse should be 3d. per bushel, or 7s. 6d. per load. The Works Committee, in submitting the proposal, intimated that they had received from the borough engineer, Mr. [illegible], a report showing that there had been a large increase in the amount of this class of refuse collected during recent months—approximately 50 per [illegible], and that, as the present charge of 2d. per bushel or 5s. 6d. per load did not cover the expenditure, an additional loss would result unless the charge for removal was increased.

Air-raid Precautions.—The Commissioner of Police of the Metropolis has issued a letter pointing out that when attacks by hostile aircraft occur attempts are made to start fires by dropping chemical substances which ignite during their passage through the air, or on reaching the ground, and which could not satisfactorily be combated with water. The letter went on to say that a practical method of dealing with such fires was to smother them with sand, and it was suggested that quantities of sand for this purpose should be provided by local authorities at as many centres as possible. It was further hinted that tripods and poles for use in preventing traffic along thoroughfares in which buildings are damaged by bombs and left in a shaken and dangerous condition should be kept in readiness for use in case of emergency, as well as shoring and hoarding materials.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Will any practical result follow the forthcoming Road Conference which is about to be held in London? Did any result follow the three International Road Congresses in Paris, Brussels, and London, which were attended by delegates from all parts of the world? Is not one of the great advantages of such conferences, however, that, although there may not appear to be any immediate result, or any great scheme for road construction put forward, the fact of engineers and surveyors meeting and comparing their experiences tends to advancement, and prevents them from becoming "narrow" and working only in grooves? Is not "tracking" as much to be deprecated with road men as with vehicles?

* * * *

Is it not an axiom that noise requires an expenditure of power for its production? If this is so, is it not evident that when traffic makes an excessive noise on any given surface of a carriageway there must be a considerable loss of power in producing this noise which might be more usefully and economically employed in propulsion? Should not a noiseless road surface and a noiseless vehicle be the aim of every one who is studying the problem of road traffic?

* * * *

Is it not interesting to note by the recently issued report of Mr. Wm. Oxtoby, the borough engineer of Camberwell, that the cost of "slopping" or scavenging his streets for 1914 was nearly £50 a mile less than it was thirteen years ago? Does not this point to the fact that improved road surfaces not only lessen the cost of maintenance, make traction easier, and improve the health of the community, but also in the end lighten the burden of the ratepayers? Shall we not all some day realise that the introduction of self-propelled traffic was really a blessing in disguise to our roads?

* * * *

Are not the results of the practical investigation of the ventilation of the technical schools at Worcester by Dr. J. N. Friend, D.Sc., the head master, of peculiar interest? Is it not rather remarkable that, in connection with this subject, so few scientific studies have been made in a practical manner? Are not Dr. Friend's conclusions as to the height of the ventilating shaft, governed by the heat producing the draught, of great value? Is it not to be hoped that Dr. Friend will continue his excellent experiments?

* * * *

Are there not a large number of scientific men in this country who would gladly give their services to the Government for the purpose of initiating new weapons of warfare, or to the improvement of munitions of war, if they could only be informed in what manner they could assist? Would it not be an excellent plan if the Government could organise special committees of experts to investigate and report on such subjects as the Government, the Admiralty, or the War Office delegated to them for a report?

* * * *

Is not Mr. Wallace E. Riche, the energetic secretary of the Roads Improvement Association, to be congratulated in his endeavour to make women take an interest in the question of roads, as set forth in his article on the subject in the *Auto Motor Journal* of the 3rd inst.? Is he not quite right in his remark that "it is woman who stimulates movements and reforms," and is it not a fact that women are often more observant than men in many matters? If [illegible] to become critics of our roads, is it not to be feared that the lot of the road surveyor will be even more trying than it is at present, if that *is* possible?

* * * *

Is it a fact that, in connection with the forthcoming Road Conference, several French and Belgian experts will attend specially to see if they can learn anything that will be useful to them hereafter when the question of the restoration of the roads of their respective countries will have to be taken into account after the damage caused to them by the war has ceased? The question is: Shall we be able to help them with practical suggestions? How can that be done unless we have local knowledge?

Assistants' and Students' Section.

Conducted by SYDNEY G. TURNER, Assoc.M.Inst.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

THE MONTHLY PREMIUM.

The following books have been chosen in respect of the premium for May, and they have been duly forwarded to the recipients:—

Mr. M. T. Roberts, of Rhyl, selected "Public Health Law," by Sydney G. Turner (St. Bride's Press, Limited); and

Mr. J. Watson, of Leeds, selected "Graphic Statics," Parts I. and II., by G. F. Charnock (J. Halden & Co., Limited).

QUESTIONS.

This week answers are invited to the following questions:—

485. Building Construction.—A casement window-frame is to be fixed in a cavity wall (10-in. stone facing, an inner facing of bricks, and a 2-in. cavity). Show clearly the methods of fixing, and any important features with respect to the relation between the window-frame and the cavity. (Mercian.)

486. Sewage Ejectors.—How would you test the efficiency of a pair of 100-gallon alternating sewage ejectors with motor-driven air compressors? (C. A. B.)

487. Structures.—Find, graphically or analytically, the maximum deflection in a steel lattice girder of the N type, supported at each end, under a load of W tons applied on the bottom boom at a distance of 24 ft. from one support. Span of girder, 72 ft.; six 12-ft. bays; depth of girder 10 ft. Take safe intensity of stress in the members as 5 tons per square inch, and Young's modulus E 13,000 tons per square inch. There is no counter-bracing. Neglect the weight of the girder itself. (B. K., *Newport.*)

488. Timbering. Describe and illustrate by a cross-section the timbering of a trench in bad ground 24 ft. deep and 4 ft. wide.

489. Road Making.—What is the best material from which to make paving setts for use in a carriage way of steep gradients? Give reasons.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

483. Bridge Construction.—How are the lengths of the four wing walls of a bridge and the horizontal angle between the bridge and each wall determined? ("Tico.")

In bridge design the determination of the angle which the wing walls make with the lines of the abutments in plan is entirely a question of economy, in which the cost of land at the site of the bridge, existing property, availability of material to form approaches, rights of way, &c., have to be considered. Wing walls serve as retaining walls supporting the earthen embankments which form the approaches to the bridge. In an over-line railway bridge, with the railway in cutting, it would in all probability prove most economical to construct the wing walls at right angles to the abutments, if the foundations near the surface of the cutting proved to be suitable; the wing walls would thus act as counterforts to the abutments, assisting the latter to take the thrust if the bridge consisted of an arch or series of arches. The economy of this method of arranging the wing walls depends upon the depth of the cutting; if the cutting were shallow, say less than 12 ft. deep, it would be better to turn the walls so that they make an angle of 135 deg., or thereabouts, with the abutments. If there is no cutting, and a raised approach is necessary, then, with land comparatively cheap, and sufficient area and material available for forming the embankment with its side slopes, the usual plan is to construct wing walls nearly parallel to the abutments. The walls would end in a newel post built at the foot of the slopes, and they should be preferably curved more or less in plan. If built straight the pressure from behind may cause a curvature of the wrong kind, and a very ugly effect will be produced. It is clear from the above that the lengths of the wing walls will depend upon the type of construction adopted. The finished slopes of the bank should end a foot or two behind the coping of the walls. However, if the site lay in an urban area, where land is valuable, other methods of forming the approaches would probably be adopted, for a high embankment with side slopes of 3 or 2½ to 1 occupies a considerable area. By arranging the wing walls at right angles to the abutments, as in the case of the railway cutting, and extending them onwards to support the embankments, we avoid the necessity for side slopes, and the amount of land required is thus considerably reduced. Of course, against this we have the cost of long retaining walls; but it should be remembered that the available area in towns is often very limited. Existing property, and rights of way, &c., which might be affected, entailing considerable sums of money for compensation for damage thereto, may compel the engineer to adopt a design which, under other circumstances, would not be desirable. In towns and other thickly populated areas, a favourite method is to build the approaches in the form of a viaduct or series of arches. This is a lighter construction than that of the solid embankment, has a better appearance, and can be so arranged that existing roads, paths, or other means of communication are not interfered with. (M. T. R., *Rhyl.*)

484. Hydrostatics.—A square sluice opening, 3 ft. by 3 ft., is formed in the vertical face of a dam, and the upper edge of the opening is 6 ft. below water. Calculate the hydrostatic pressure upon the square area, and find the exact position of its centre of action. (A.M.I.C.E.)

Suppose the opening to be closed by a sluice valve, then the thrust on the valve = weight of a column of water whose base is the area of the valve × by the depth of centre of gravity of the valve below the free surface—

$$\text{i.e., Thrust} = 62.5 \times 9 \times 7.5$$
$$= 4218.75 \text{ lb.}$$

∴ Hydrostatic pressure on area = 4218·75 lb.

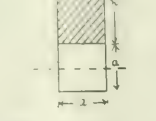
It is now required to find the centre of pressure or centre of action.

$$x = \frac{K^2}{\bar{x}}$$

where x = depth of c.p. below water surface

K^2 = (radius of gyration)² round surface line

$\bar{x}$ = depth of c. of gravity



By Rowth's Rule

$$K^2 = \left(\frac{a}{2}\right)^2 + \left(h + \frac{a}{2}\right)^2 = \frac{a^2 + 3ah + 3h^2}{3}$$

and $\bar{x} = h + \frac{a}{2} = \frac{2h + a}{2}$

$$\therefore x = \frac{a^2 + 3ah + 3h^2}{3} \times \frac{2}{2h + a} = \frac{2(a^2 + 3ah + 3h^2)}{3(2h \times a)}$$

Substituting the figures given $a=3$ and $h_0=6$ we get

$$k=\frac{2\,(9+54+108)}{3\,(12+30)}\cdot\frac{342}{45}=7{\cdot}6\text{ ft.}$$

∴ Centre of action = 7·6 feet below water level.

(J. G. W., *Downpatrick*.)

Consider an elemental strip at a depth of x ft. of width Δx ft.

Pressure at the level of the strip

= weight of x cub. ft. of water per sq. ft.

$=62{\cdot}5\,x$ lb. wt. per sq. ft.

Area of strip $=3\,\Delta x$ sq. ft.

∴ Thrust on strip $=62{\cdot}5\,x\times3\,\Delta x$ lb. wt.

$=187{\cdot}5\,x\,\Delta x$ lb. wt.

∴ Total thrust on rectangle $=\sum_{x=6}^{x=9}187{\cdot}5\,x\,\Delta x$ lb. wt.

$$\therefore\text{ Thrust}=\int_6^9 187{\cdot}5\,x\,dx$$

$$=187{\cdot}5\left[\frac{x^2}{2}\right]_6^9$$

$$\frac{187{\cdot}5}{2}\,(81-36)$$

$$\frac{187{\cdot}5\times45}{2}$$

4218·75 lb. wt.

Also by the formula $p=\bar{x}\,w\,a$,

where p = total thrust

$\bar{x}$ = head on the centre of gravity

w = weight of liquid per unit volume

we have $p=7\tfrac{1}{2}\cdot9\cdot62\tfrac{1}{2}$

$$\frac{15\cdot9\cdot125}{4}$$

$$\frac{16875}{4}$$

$=4218{\cdot}75$ lb. wt.

To find the position of the centre of pressure, which is obviously on the centre line of symmetry, take moments about the line of water-level.

Thrust on elemental strip $=187{\cdot}5\,x\,\Delta x$

∴ Moment of this thrust about water-level

$=187{\cdot}5\,x\,\Delta x\,x$ ft.-lb.

The sum of the moments of all the thrusts

$$=\int_6^9 187{\cdot}5\,x^2\,dx$$

$$\left[\frac{187{\cdot}5}{3}\right]_6^9$$

$$\frac{187{\cdot}5}{3}\,(729-216)$$

$=513\times62{\cdot}5$ ft. lb.

We have already shown that the resultant thrust is

$$\int_6^9 187{\cdot}5\,x\,dx=\frac{187{\cdot}5\times45}{2}$$

$=4218{\cdot}75$ lb. wt.

Let d be the distance in feet of the centre of pressure below the water-level.

Then moment of resultant thrust $=4218{\cdot}75\,d$

$$\therefore\ 4218{\cdot}75\,d=62{\cdot}5\times513$$

$$\therefore\ d=\frac{62{\cdot}5\times513}{4218{\cdot}75}=7{\cdot}6\text{ ft.}$$

We can obtain this result from the formula

$$h=\tfrac{2}{3}\left(\frac{h_1^3-h_2^3}{h_1^2-h_2^2}\right)$$

where h = head on centre of pressure

h_1 = head on upper edge of rectangle

h_2 = " lower " "

$$\therefore\ h=\tfrac{2}{3}\left(\frac{9^3-6^3}{9^2-6^2}\right)$$

$$=\tfrac{2}{3}\left(\frac{729-216}{81-36}\right)$$

$$=\frac{2\times513}{3\times45}$$

$=7{\cdot}6$ ft.

or from the well-known expression

$$h=\frac{\sin^2\theta\,K^2+h_0^2}{h_0}$$

where h = head on centre of pressure

h_0 = head on centre of gravity of rectangle

θ = angle which rectangle makes with the horizontal

K = radius of gyration of rectangle about a horizontal axis through the centre of gravity.

Substituting, we have

$$h=\frac{K^2+h_0^2}{h_0},\quad\text{since }\angle\theta=90$$

$$\frac{\left(\frac{3}{\sqrt{12}}\right)^2+\left(7{\cdot}5\right)^2}{7{\cdot}5}$$

$$\frac{\frac{9}{12}+\frac{225}{4}}{7{\cdot}5}$$

$$\frac{\left(\frac{675+9}{12}\right)\frac{2}{15}}{2}$$

$$\frac{684\cdot2}{12\cdot15}=7{\cdot}6\text{ ft.}$$

The centre of pressure will therefore be 7·6 feet below the water-level and 7·6—6, *i.e.*, 1·6 feet below upper edge of submerged rectangle.

(B. K., *Newport*.)

CHEAP ROADS AT HORNSEY.

BITUMINOUS SURFACING AT WATER-BOUND PRICE.

The ratepayers most pleased and comfy on their streets will be those of Hornsey this year, but the next best will have an opportunity of inspecting some of the results of up-to-date road carpeting.

The [illegible] engineer, has made much overworked old labour-saving machinery [illegible] engineering, but it is no exaggeration to suggest that the work now being carried out by Mr. H. J. Lovegrove, the borough engineer of Hornsey, will ultimately lead to an entire change in the methods of road surfacing in urban districts. In brief, Mr. Lovegrove has produced a bituminous road carpet from prepared destructor clinker which, he claims, need not exceed in cost the ordinary water-bound macadam. This new carpet has all the properties that are conducive to long life—homogeneity, absence of brittleness, resiliency, and freedom from tendency to disintegrate in bad weather. Time alone will prove the life of this surface, but the [illegible] which will be kept in repair by moderate attentions and the heavy wood pavements rains of last winter, gives ground for the highest optimism.

In his earlier experiments Mr. Lovegrove milled his [illegible] resembled sand in its tendency to wash out in the winter. Now the clinker is pulverised and sifted, the [illegible] is used for filling and the finer for the carpeting. This fine material grades in highly [illegible] from a grain which refuses a [illegible] to be rubbed down to impalpable powder.

The binder now employed is the variety of Mexican bitumen known as Mexphalte. This is mixed while hot. Mr. Lovegrove's practice is to clean his old road surface, fill in the holes with the coarser material, and "carpet" with the finer mixture to a depth of 1¼ in. to 1½ in.

The road now being surfaced is the Ferme Park-road, running parallel with the Great Northern Railway between Hornsey and Harringay; another, surfaced last year, and now subjected to a three minute omnibus surface, is Park-road, Cranley-gardens. The latter shows no wear round the manholes, and in summer consistency might be taken for hard rubber. It is a fine specimen of road surfacing, and is estimated by the borough engineer to return its money if it lasts but three years.

The plant at Hornsey is at present of the make-shift order. Even now Mr. Lovegrove claims to carpet his roads at a charge of 2s. 3d. for the carpet itself, or 3s. 3d. including preparation. With a scientifically arranged plant, such as he now has in view, these costs will be reduced to the "water-bound" level.

Advocates of resiliency will also find in Hornsey an excellent example supporting their theories. This is a thoroughfare (the Fortis Green-road), an 18-ft. road, carrying 700 motor omnibuses a day, surfaced by private contractors on a foundation of destructor clinkers.

Brighton and Hove Trackless Trolleys.—The Hove Town Council at their last meeting received a report from the Legal and Parliamentary Committee having for its object the postponing till after the war of further proceedings connected with the establishment of trolley traction for the borough.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Mansfield T.C. (June 1st. Mr. Raymond Unwin).—This was an inquiry into the application of the corporation for authority to prepare a town planning scheme.—The town clerk, Mr. J. H. White, explained that the application was in regard to two areas—the smaller one adjoining Chesterfield-road, and the larger one practically including the whole of the unbuilt-upon eastern part of the borough. A meeting of the owners had been called, and at that meeting there was no opposition whatever to the scheme. The only feeling expressed was that the scheme did not go far enough, and instead of including only half of the area the whole of the undeveloped land in the borough should be included. The council were not adverse to an additional scheme, and the borough surveyor, Mr. T. P. Collinge, prepared necessary plans; but it appeared to the town council that in order to present a satisfactory scheme for the north-western part of the borough it must embrace part of the urban district of Mansfield Woodhouse. The council of that district was approached with a view to joint action, but, unfortunately, with no satisfactory result, that authority feeling that if there was to be any scheme they should prepare one of their own. It was also considered desirable that that part of Blidworth in which Rainworth was situated should be included in the scheme, and the Skegby Rural Council were communicated with as it was felt desirable to proceed on similar lines. The Skegby Council decided to proceed in the matter, but he did not know if they had a scheme as yet. With regard to the smaller area to be dealt with, this was close to the built-upon portion of the town. Mr. T. P. Collinge, formerly borough surveyor, and now holding a similar position at Rotherham, gave details concerning the areas.

Seaton Delaval U.D.C. (June 10th. Mr. George L. Pepler).—At this inquiry, with respect to an application for a town planning scheme, the clerk to the council, Mr. W. D. Soulsby, said it was proposed to include 2,640 acres of their total of 4,454 acres in the development of the scheme. He drew attention to the local signs of development, and said that at Seaton Sluice and Old Hartley the council anticipated the development of a popular seaside resort. At present there was old property in that district which might be in the way.

Stafford T.C. (May 26th. Mr. A. G. Drury).—£19,000 for sewage disposal works.—The borough engineer, Mr. W. Plant, stated that the farm had been in a bad condition for the last four years. Giving details as to the new scheme, he said that their present average dry-weather flow of sewage was 645,000 gallons per day. Owing to inability to rest any portion of the land for a sufficient period, nitrification had gradually diminished during recent years, so that the whole area was more or less sewage sick, and great difficulty was experienced in getting the sewage through the land. No other suitable land was available in the vicinity, even were it desirable to extend the present system on an area situate so near the town. Experiments had shown that the sewage could be treated efficiently on bacteriological lines. In designing the new works, he had based his calculations on a dry-weather flow of sewage of 700,000 gallons per day, which allowed for an increase in the present population draining to the works of 2,300. He esti-

Whitley and Monkseaton U.D.C. (June 11th. Mr. George L. Pepler).—This was an inquiry into an application for authority to prepare a town planning scheme for the still undeveloped area in the district and partly within the urban district of Earsdon.—The application was made under Part II. of the Housing and Town Planning Act, 1909. The clerk, Mr. A. Whitehorn, stated that the area of the land included in the town planning scheme was 1,858 acres, and included 180 acres in the Earsdon urban area. The Whitley surveyor, Mr. A. J. Roussel, gave details as to new arterial roads embodied in the scheme. One of these proposed roads would, he said, improve the approach to the district from the west, and it was in order to show this road that they included the 180 acres of land in the Earsdon district. Mr. T. Bertram (on behalf of the Earsdon Council) asked that the 180 acres of land in that council's area should be deleted from the scheme.

APPLICATIONS FOR LOANS.

Barrow-in-Furness T.C.—£2,000 for extensions to the refuse destructor.

Bristol T.C. — £26,949 for a 6,000-kw. turbo-alternator.

Bristol Burial Board.—£10,970 for the provision of a cemetery.

Cork R.D.C.—£2,500 for the provision of wells and pumps.

North Derbyshire Isolation Hospitals Committee.—£16,750 for convalescent wards at four hospitals.

Rochdale T.C.—£4,400 for electricity mains.

Spenborough U.D.C.—£2,320 for retorts for the gas-works.

LOANS SANCTIONED.

Heywood T.C.—£1,731 for the purposes of a council school.

Littlehampton U.D.C. — £2,994 for an isolation hospital.

Louth T.C.—£527 for a steam roller.

Newry No. 2 R.D.C.—£1,000, supplemental loan for the erection of cottages.

Saffron Walden R.D.C.—£400 for the purchase of sites for the erection of houses.

Southampton T.C.—£1,085 for a motor fire engine.

FORTHCOMING INQUIRIES.

JUNE.

	£
21.—**Reigate.** For the purposes of paving, road improvement, police and fire stations, and electricity (Mr. F. H. Tulloch)	19,000
23.—**Darlington.** For the purposes of the electricity undertaking (Mr. H. Shelford Bidwell)	34,950
24.—**Middlesbrough.** For the purposes of the floating hospital (Mr. H. Shelford Bidwell)	2,250

Arterial Roads in Greater London.—A meeting of the Southern Sectional Conference will be held to-day (Friday) at the Local Government Board offices, at 2.30 p.m.

Oxford Roads.—Clarmac Roads, Limited, Hennam House, Westminster, write with reference to paragraph 3, "Things One Would Like to Know," in our last issue: "We have much pleasure in informing you that the roads in and around Oxford should shortly be in a very good condition, as the city surveyor has placed an order with this company for at least 300 tons of Clarmac for his roads."

Business Announcement.—Wailes Dove Bitumastic, Limited, 49 Blackfriars-street, Manchester, write: "Mr. Lawson having joined H.M. Forces, Mrs. Lawson, who has had previous commercial experience, has voluntarily offered to step into the gap. We have cordially accepted her services, and now confidently appeal for the continuance of the esteemed orders and business so kindly accorded to her husband in the past."

Cost of London Tramway Strike.—The tale of the recent London tramway strike is told in the receipts, as presented to the County Highways Committee. These amounted, in the week ended May 19th, to £22,460, as compared with £44,960 in the corresponding week of last year. For the following week the receipts again showed an enormous falling off—from £43,760 to £12,610. In the succeeding week again there was a decline from £47,340 to £23,580. There was thus a loss in receipts of over £77,000. In the week ended May 26th the number of passengers carried was 2,877,000. In the corresponding week of last year it totalled 10,437,000.

Municipal Employees and Munitions.—With reference to the appeal made to Local Authorities to release employees for increasing the output of munitions of war, the Local Government Board have notified that the names of a large number of men whose services might be available have been sent to the War Office. They add: "It may not be easy to absorb at once slowly unskilled labour in work much of which is of a highly technical character, but arrangements have been made for an official of the Board of Trade to assist in demands. In communicate with the councils' officials and arrange with them as to the engagement of suitable men."

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information [illegible] complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below: Buildings—Warrington; housing and town planning—South Shields; roads and materials—Monaghan, Seaford; sewerage and sewage disposal—Chester-le-Street, Leeds, Leek; water, gas and electricity—Croydon, Holywood, St. Pancras, Salford. Particulars of other projected works will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Bolton T.C.—Vice-Chancellor Stewart Smith, K.C., gave judgment at the Manchester Chancery Court in an action brought by the Duchy of Lancaster and the Bolton Pure Ice and Cold Storage Company, Limited, against the Bolton Corporation to prevent the expenditure of the borough funds in the provision of cold storage facilities and the manufacture of ice, otherwise than for the benefit of market tenants. The Vice-Chancellor said the corporation were by statute authorised to provide a market with all such approaches, works, and conveniences as they thought fit, and it was admitted by the plaintiffs that the supply of cold storage and ice was a convenience to the market, but it was argued that in so far as it exceeded the requirements of the tenants the corporation were going outside their powers. He concurred in that view.

Dulverton R.D.C.—It is proposed to build an isolation block, at an estimated cost of £100.

Dunbar T.C.—It has been decided to borrow £1,800 to meet the cost of a new wall which is being built up along the south side of the Castle Park. The council have also had under consideration a report from the burgh surveyor, Mr. A. Moody, concerning the state of the north wall of the new harbour, and it has been decided to carry out important repairs there in order to protect the structure from further havoc by the [illegible] sea. So far as [illegible] minor repairs are concerned, these are not to be proceeded with till a later stage.

Hucknall U.D.C.—The council have received the public hall and a piece of land in the Elliott estate. The value of the buildings is estimated at about £2,000.

Leith T.C.—Leith Public Health Committee have resolved to delay proceeding with the scheme for the erection of a sanatorium at Leith Public Health Hospital in view of the circumstances arising out of the war.

Surrey C.C.—Plans are being prepared for a proposed tuberculosis dispensary at Wrotham.

Tendring R.D.C.—In connection with the St. Osyth water supply scheme a tender has been accepted for the construction of the foundations of the water tower, the steelwork for which is ready.

Walsall T.C.—A recommendation has been adopted by the Tramways Committee in favour of the purchase of land in the vicinity of the tramway depot, at a cost of £900, as a site for a motor-'bus depot.

Warrington T.C.—The council have approved the plans of the borough surveyor, Mr. A. M. Ker, for the erection of a new smallpox hospital, at an estimated cost of £1,500.

HOUSING AND TOWN PLANNING.

Downpatrick R.D.C.—The council have considered an application on behalf of the contractors for labourers' cottages for an increase in the contract price, and have decided to grant £10 extra per cottage. There are 213 cottages under the present scheme.

Dunfermline T.C.—On the subject of the development of the Rosyth garden city, Bailie Norval, chairman of the Town Planning Committee, stated on Monday that a new agreement had been entered into between Lord Elgin and the committee. The town planning scheme, which has been under consideration for nearly three years, is now ready for presentation to the Local Government Board for approval.

Falmouth T.C.—It has been agreed to take up a loan of £1,500 for the fifth instalment of the housing scheme.

Greenock T.C.—Tenders are to be obtained for the erection of 150 houses in Roxburgh-street.

South Shields T.C.—It is the intention of the council to apply to the Local Government Board to [illegible] to prepare town planning [illegible] and a scheme has been [illegible] the passing of a local provisional notice. The borough engineer, Mr. L. Roseveare, has prepared a plan of the area proposed to be included in the scheme, which is about 2,000 acres.

REFUSE COLLECTION AND DISPOSAL.

Acton U.D.C.—It is proposed to instal slab-making machinery at the dust destructor, at an estimated cost of £300.

Ruthin T.C.—The borough surveyor, Mr. J. J. Price Jones, has received instructions to report upon the question of refuse disposal.

ROADS AND MATERIALS.

Acton U.D.C.—The surveyor, Mr. F. Sadler, has received instructions to carry out repairs to South-parade, Bedford Park, at an estimated cost of £150, and repairs to Lynton-road and Mayfield-road, at an estimated cost of £100.

Armagh C.C.—The county surveyor, Mr. R. H. Dorman, in his report stated that if an increased quantity of tar-macadam, Rocmac and clean, hard stone could be laid down on the roads each year in place of inferior material the surface work on the roads could be much reduced, and a larger number of the men usually employed on the roads could be put into the quarries during the summer. In that way some economy could be effected in the cost of manual labour which would help to counterbalance the increase in the cost of wages.

Chesterfield T.C.—The borough surveyor, Mr. Vincent Smith, has received instructions to prepare a report on the probable cost of a new street from Saltergate to Spencer-street.

Derry C.C.—On the suggestion of the Local Government Board, the council recently passed a resolution applying for an extension of the legal limit of road expenditure in Magherafelt rural district. The county council had forwarded a resolution asking the board to allow the carrying forward of an unexpended balance in respect of road improvements. There was no statutory authority under which the county council's proposal could be carried out, and the extension of the limit of expenditure, as suggested by the Local Government Board, was the only way of solving the problem.

East Grinstead R.D.C.—Messrs. G. Percy Trentham, Limited, wrote stating that they could not undertake the private street works in the Warren-road, Crowborough, without an alteration in their tender which increased it by about £100. It was decided to accept Messrs. Hudson's tender at £408, which was the next lowest.—Messrs. Edward Free & Sons wrote that they could not undertake private street works at Three Bridges, owing to difficulties caused by the war, and asked leave to withdraw their tender. This was agreed to, and the matter was postponed for the present.

Hessle U.D.C.—A letter has been received from the Local Government Board stating that they approve generally of the Southgate and Hull road improvement scheme, but that under the circumstances the scheme would have to stand over for the present.

Kildare C.C.—The county surveyor, Mr. J. Rorke, reported at the meeting held recently that he had been informed by the Commanding Officer, Royal Engineers, that he had recommended his superior authorities completely to reconstruct (free of cost to the county) the road between the Curragh siding and Ballymanny (known as the Standhouse-road), and also a portion of the road from the water tower to Brownstown.

Maldens and Coombe U.D.C.—The surveyor, Mr. R. H. Jeffes, has been authorised to obtain quotations for a new tip-cart.—Consent has been given to the surveyor to have portions of the main road treated with Tarvia and granite chippings, at the expense of the Trinidad Lake Asphalt Paving Company, Limited, the contractors for the maintenance of certain portions of the road.

Middlesex C.C.—The Highways Committee have had under consideration an application from the

Hendon Rural District Council that they may be allowed to lay Tarviated granite on the subsidised roads "A" and "B" in their district, and to charge the cost in their annual accounts against the county council. The county engineer, Mr. W. T. Wakelam, reported upon the application as follows: "The principle adopted and still in practice in regard to applications of the kind is to raise no objection to the use of Tarviated granite or similar material for resurfacing, and to allow the local authority to charge in their annual maintenance account an amount not exceeding the average annual cost per super. yard for maintenance in ordinary water-bound macadam." The council have agreed to the suggestion of the county engineer.

Monaghan C.C. The council last week agreed to purchase a new steam roller, provided the cost has not increased too much.—It has been decided to remunerate the assistant surveyors with a bonus at the end of the year for the additional work they have had to do under the direct labour scheme.

Norfolk C.C. The county surveyor, Mr. T. H. B. Heslop, reported recently as to the supply of granite for the roads in regard to which there had this year been considerable difficulty. Originally the committee accepted four tenders. Two of these were for seaborne materials, but it was found impossible to get granite by sea, and two other tenders were accepted. Still the four firms selected could not supply all the granite required, and it would be necessary to enlarge the number of contractors. No doubt there would be an extra charge of probably from 6d. to 1s. a ton.

Northampton T.C.—The Streets Committee recommend the expenditure of £1,000 upon the purchase of property in Bridge-street for the purpose of an improvement scheme.

Seaford U.D.C.—A decision has been reached with the military authorities on the question of the repair of the local roads. The council will pay £2,151 towards the cost of repair, and the War Office's contribution through the Road Board will be £2,009. That arrangement was submitted to the council by the Road Board and accepted subject to the concession that they be granted the money on loan free of interest for five years, and that the board pay £297 for the tarring.

Steyning West R.D.C.—Plans and estimates prepared by the surveyor, Mr. F. Slaughter, for making up Penhill-road, have been approved. The estimated cost of the road work is £2,337, and of the sewering £426.

Wombwell U.D.C. A scheme, estimated to cost £220, has been approved for widening the main road at the junction with Brampton-road. The money will be found by the county council.

SEWERAGE AND SEWAGE DISPOSAL.

Chester-le-Street R.D.C.—The improvement of the sewage disposal works has been referred to committee for consideration.

Church Stretton U.D.C.—It has been agreed to effect alterations to the storm-water tanks at the sewage outfall works, at an estimated cost of £25.

Darlington R.D.C.—It has been decided to prepare a drainage scheme for Sadberge.

Gravesend T.C.—The corporation are advised by the Local Government Board to proceed with the preliminaries of the sewerage scheme, notwithstanding that sanction cannot be given to a loan for the work at present.

Langholm T.C.—Negotiations are in progress with the Dumfriesshire County Council Committee with the view of a friendly settlement of the litigation started by the county council to compel the burgh to carry out a scheme to prevent the pollution of the river Esk at Langholm by burgh sewage. The proposal is that a modified purification scheme might be resolved on. The burgh has hitherto been opposing the suggested scheme as too expensive and unnecessary.

Leeds T.C.—On the occasion last week of the annual inspection of the sewage disposal works at Knostrop, Alderman T. Oldroyd, chairman of the Leeds Sewerage Committee, stated that the cost of the sewerage scheme when completed would be £1,277,000. The new pumping station was nearly finished, but the committee were in a difficult position in regard to that matter, as he had not yet brought before the council a recommendation that the cost of the station —some £20,000—should be sanctioned. It was, however, absolutely necessary that the station should be erected, for without it the whole of the outlay of £400,000 already expended was practically useless. It was his idea to put the whole matter before the committee at their next meeting, with the idea of gaining the consent of the corporation to the project.

Leek R.D.C.—It has been decided to carry out a sewerage scheme for Endon, and the Local Government Board is to be asked to grant a loan for the work.

Middlesbrough T.C.—At a meeting of the Sanitary Committee recently the borough engineer, Mr. S. E. Burgess, drew attention to the very bad condition of a section of the sewer draining the Corporation-road area, which has its outfall near certain works. He urged that its repair was a work of necessity, and estimated the cost at £1,000. The committee approved of the scheme, and authorised an application to the Local Government Board for power to borrow the money on the ground that it was a matter of urgency in the interests of public health. It was also agreed to invite tenders for the supply of the necessary cast-iron pipes, and to proceed promptly with the work.

Penybont R.D.C.—A letter has been received from Mr. J. T. Howell, clerk to Bridgend Urban District Council, calling attention to pollution of the Ogmore river by crude sewage, this pollution being due, it was alleged, to a breakdown in the sewage system of the Ogmore and Garw Council. Mr. T. Butler said he understood that the whole of the sewage of the Ogmore Valley and part of that of the Garw Valley was flowing into the river, and that the work of repairing the sewers and outfall was suspended, the Ogmore and Garw Council awaiting the grant of a loan. According to Mr. Eiryn Davies, the sanitary inspector, the pollution had been going on for twelve months in the Ogmore and two years in the Garw. It was resolved to co-operate with Bridgend Council in taking steps to remedy the alleged nuisance.

Sunbury U.D.C.—The council are seeking the sanction of the Local Government Board to a loan for an additional engine and compressor at the outfall works.

Surbiton U.D.C.—In February last the Local Government Board held an inquiry into an application from the council to borrow the sum of £4,900 to liquidate the balance of the "extras" incurred over the new sewerage scheme. In a letter to the council the Local Government Board have now formally sanctioned a loan of £4,875, subject to certain conditions. The £500 granted to Messrs. Dick, Kerr & Co., contractors, as a bonus to expedite the work (so that it should be completed before the expiration of the existing contract with the Kingston Town Council for the treatment of the sewage of Surbiton), is to be paid out of current rates; a term of thirty years is allowed for the repayment of interest and principal of £791, but the board stipulate that the interest and principal on the remaining £3,584 must be paid in six years. This latter sum represents the amount of the indebtedness on the superseded works at Tolworth, which the board contends should have been cleared off before the original loan for the new sewerage works was taken up.

Wolverhampton T.C.—The annual report of the Sewerage Committee on the farming operations at the Barnhurst Farm showed a balance in favour of the committee of £2,592. This financial position was attributed, in a large degree, to the excellent work of the farm bailiff (Mr. W. Craig), whose salary it was decided to increase from £200 to £280.

WATER, GAS, AND ELECTRICITY.

Aberdeenshire C.C.—The Dear District Committee have resolved to take the necessary steps to form New Pitsligo into a special water district for the purpose of a water supply.

Cardigan R.D.C.—A committee has been appointed to go into the question of a water supply for Tremain.

Castle Ward R.D.C.—The question of a water supply for Whalton is under consideration.

Croydon T.C.—The council on Monday decided to promote a Bill in Parliament to construct new wells and works a few miles to the west of the borough, and to apply the chlorine system of purification to the whole water supply. The scheme will take five years to complete, and will cost £250,000.

Edinburgh T.C.—The city council on Tuesday accepted the tender of the Stirling Boiler Company, Limited, Renfrew, at £32,286, for water-tube boilers for the new power station at Portobello.

Halstead R.D.C.—Consideration is being given to the plans of Messrs. Taylor & Wallin, Norwich Chambers, Ipswich, for a water supply for Castle Hedingham, at an estimated cost of £2,100.

Hertford R.D.C.—The council are negotiating for a water supply to Bramfield, from the Western Water Company, and are hoping to obtain sanction to a loan of £1,400 for this purpose.

Holywood U.D.C. In reply to a letter from the council, the Local Government Board have intimated that they had recommended to the Commissioners of Public Works the loan of £5,750 sanctioned to the council for the purpose of providing additional storage reservoirs. As the matter is still in abeyance, the council decided to write to the Treasury direct, putting before them the true position of affairs in the town.

Monk Bretton (Yorks) U.D.C.—It has been agreed to provide a main water supply for Westgate, at an estimated cost of £300.

Paul U.D.C. An improved water supply is to be provided for Newlyn, at an estimated cost of £3,000.

St. Pancras B.C. — The Electricity Committee recommend the borough council to make application to the Treasury for sanction to borrow £22,530 for the King's-road electricity station.

Salford T.C.—The council on Wednesday last decided to purchase additional plant for the electricity station in Frederick-road, at a cost of £16,200, in order to meet existing and future requirements, and particularly the pressing need of many large firms in need power to carry out war contracts for the Government.

Shrewsbury T.C.—There was a surplus of £785 on last year's working of the electricity undertaking, compared with £131 in the previous year.

Thakenham R.D.C.—The Local Government Board having intimated their willingness to sanction a loan for the Storrington water scheme, it is probable that immediate steps will be taken to put the work in hand.

Totnes R.D.C.—The sanitary inspector, Mr. F. Goode, has prepared plans for a new water main at Bittaford, and the Ugborough Parish Council have agreed to recommend the district council to carry out the work.

Walmer U.D.C. The water undertaking has contributed £500 to the rates as profits on the last half year's working.

Walsall T.C.—The balance-sheet of the electricity undertaking showed a net profit of £1,385 last year.

MISCELLANEOUS.

Ealing T.C.—On the subject of air-raid precautions, the borough surveyor, Mr. W. R. Hicks, reported that stores of sand had been provided at thirty-three different places within the borough, and that he had arranged for men to be at the several places without delay in case of a raid, and further that he had ordered twenty-four respirators and six chemical extinguishers for the use of the fire brigade. The action of the borough surveyor was approved.

Surbiton U.D.C.—On Monday it was agreed—on the suggestion of a member that a register of persons willing to undertake agricultural work in certain seasons should be compiled—that the chairman, Mr. S. Kavanagh, J.P., should express the views of the council at a conference on the subject which he was to attend at Guildford.

Town Planning and Engineering.—A proposal by the College School of Architecture to exclude the subject of town planning from the curriculum of the Royal Technical College, Glasgow, has been vetoed by the college governors.

Tar in Fishing Waters.—At the annual meeting of the Salmon and Trout Association in London on Tuesday it was stated that examination in regard to tar and its effects on fish life were being continued, and a large number of fish, sent by various boards and fishery owners, had been examined in order to ascertain the causes of death. This question has been considered by several of the Fishery Boards in Wales, and it is alleged that following heavy rain the tar-spray washed off the main roads found its way into the rivers. Opinions differ as to the effect of the tar on fish. Some hold that it is deleterious, while others say it is perfectly harmless. The results of expert examination are looked forward to with interest by fishermen.

PERSONAL.

Mr. F. W. Sport[illegible], engineer of York, has been elected a Fellow of the Royal Sanitary Institute.

Mr. R. Lee, manager of the Ramsbottom sewage disposal works, has been voted £50 for extra services.

Mr. P. A. Benn, city surveyor of Lichfield, has received a Sheraton drawing-room timepiece from the members of the corporation and officials on the occasion of his marriage.

Mr. D. V. Howard, engineer and surveyor to the Sandgate Urban District, was married recently to Miss C. E. Bull, only daughter of the late Mr. F. J. Bull, of Chesham, Bucks.

Mr. H. E. Bellamy, formerly resident engineer, Public Works Department, Sydney, and now naval civil engineer under the Commonwealth Government, has been elected a Fellow of the Royal Sanitary Institute.

Mr. R. V. Pierce, surveyor to the Melksham Urban District Council, having enlisted, Mr. Stanley Bolwell, son of Mr. A. R. Bolwell, surveyor to the Bath Rural District Council, has been appointed temporarily to the position. The salary is £104 a year.

Mr. Frank Darling, of Toronto, will, at the general meeting of the Royal Institute of British Architects on Monday next, be presented with the Royal Gold Medal for Architecture. This is the first time this [illegible] citizen of one of the great Dominions.

Mr. T. H. Scott, burgh surveyor of Inverness, was last week presented by the heads of the various municipal departments with a solid silver salver, a silver cigar case, and a handsome Cairngorm brooch for Mrs. Scott, on his departure to take up an important appointment at Port of Spain, Trinidad.

Mr. Reginald Brown, of 21 Old Queen-street, Westminster, and Town Hall, Southall, has been elected a Fellow of the Royal Sanitary Institute. Mr. Brown is also a member of the Institution of Civil Engineers, Institution of Mechanical Engineers, and Institution of Municipal and County Engineers, and a Fellow of the Surveyors' Institution.

Mr. Joseph Lambert Associate, M.Inst.C.E., M.R.San.I., F.I.S.E., deputy engineer and surveyor to the Tottenham Urban District Council, has been unanimously appointed acting engineer and surveyor, and Mr. Walter Vincent, the next assistant, acting surveyor to the Education Committee, during the absence of Major W. H. Prescott, R.E., M.Inst.C.E., on active service.

Mr. Wm. Cuthbertson, burgh surveyor, Moffat, has resigned his appointment, having received a Government appointment as master of works in Edinburgh in connection with the building department of the Scottish Territorial Association. Mr. Cuthbertson, who was formerly burgh surveyor at Lockerbie, has [illegible] at Moffat.

Mr. A. A. Fillary, district surveyor for Streatham West, is recommended for appointment as district surveyor of Greenwich. On the resignation, recently, of Mr. A. Conder from the position of district surveyor of the combined district of Greenwich and Woolwich, the Building Acts Committee of the London County Council divided the district into two, and decided to appoint separate officials. They invited applications from certain of the existing district surveyors, but no candidate presented himself for the Woolwich appointment, and only ten applications were received for the district of Greenwich. The committee propose to make temporary arrangements for the supervision of the Streatham West and Woolwich districts, as they are of opinion that no new district surveyors should be appointed while possible candidates are on war service.

OBITUARY.

Mr. F. E. G. Bradshaw, borough surveyor of Tamworth, died recently, we regret to state.

Mr. Richard Thomas Elsam has just died, we regret to learn, at Teddington, at the age of seventy-seven. He was for fifty-two years auditor to the Hampton Court Gas Company, and was formerly surveyor to the Hampton Wick Urban District Council.

The deepest sympathy will go out to Mr. Frank Smith, first architectural assistant in the office of the borough engineer and surveyor of Southend-on-Sea, in the death of his wife, which took place on Tuesday, following severe injuries sustained during the Zeppelin raid on the night of May 26th.

THE USE OF ELECTRIC VEHICLES IN MUNICIPAL SERVICE.*

By F. Ayton, M.I.E.E.

There could hardly be conceived a more suitable field for the employment of the electric battery vehicle than that connected with municipal service. This is because the work to be done lies entirely within the proper sphere of this particular type of vehicle—viz., short distance haulage at moderate speeds. The mileage capacity per charge—*i.e.*, 35 to 45 for the heavier vehicles—is sufficient for practically every duty which the municipal vehicle has to perform, but it must not be forgotten that, by a mid-day boosting charge, the daily mileage may be considerably increased. In fact, the only limit to the daily mileage is the time required to charge the battery, and, as the modern types of battery allow of the charging being commenced at a comparatively high rate, the time taken, especially for boosting charges, is very materially reduced from the period which used to be considered necessary. As an instance of the amount of work the electric vehicle is capable of performing, the electric street watering and sewer flushing vehicles belonging to the city of Calgary in Canada are reported to be in use for a 16-hour day at certain periods of the year, the superintendent of street cleaning stating that each vehicle had replaced five horse teams, with a resultant saving in expense of no inconsiderable amount.

Naturally, the main reason for urging the adoption of electric vehicles by municipalities is the degree of economy which attends their use in substitution for horse haulage. Wherever the electric has been employed in its legitimate sphere, the claim of economy has been proved to the hilt. In citing evidence in support of this statement, attention may be directed to the experience of that progressive city which can lay claim to being one of the pioneers in the municipal operation of the electric vehicle—*i.e.*, Glasgow—where the electricity department found that their first electric van, of 1-ton capacity, did the work of two horses, at a saving in expense and with greater efficiency; while, compared with a petrol van, which the department was previously using, the electric did the same work with a saving in expense in the neighbourhood of £240 per annum. Other evidence is afforded by the refuse collection trials at Barnes and at Heston and Isleworth, while the instance of Calgary, previously mentioned, provides an additional illustration of the financial advantages accruing from the employment of this type of road motor, the daily saving, as against horses, by the operation of two watering and flushing vans, being given as about £5.

The durability of the electric vehicle is a feature not to be lost sight of, and there is ample evidence, based upon experience, that there is justification for putting the average life of a modern vehicle of good make at not less than ten years, assuming reasonable use and proper upkeep. In the United States electric commercial vehicles built twelve years ago are still in daily service, and many seen in the streets are well over six years old.

RELIABILITY.

Reliability is another feature of the electric vehicle which must not be overlooked, for experience has shown that this type of automobile can keep the road day by day for more days in the year than any other type—in fact, records show that it is safe to estimate, in the case of a fleet of electric vehicles, that the average working days in a year for each machine will not be less than 97 to 98 per cent of the maximum possible. The reasons for this are threefold; first, the simplicity of the mechanism; secondly, the strong construction possible on this account; and, thirdly, the fact that, owing to the simplicity and fewness of the working parts, any repair or replacement can usually be effected during the night, or in such a short time as not to interfere with the use of the vehicle. The nett effect of all this is that, where several vehicles are operated, fewer spare ones need be kept than if petrol or steam machines were employed.

In the case of those municipalities that own electric supply undertakings, there is a further and very pertinent reason why they should set the example as users of electrically driven vehicles, and that is the important new source of revenue which the general use of these vehicles in any district will open up. And the value of this additional source of revenue is emphasised by the fact that the demand in connection with it need never come on during "peak-load" hours; hence it may be dealt with without requiring additional expenditure in plant, buildings, or mains. Moreover, as its effect will ever be to even out the load curve, and so lead to greater economy in the cost of generation, this will in time permit of a lower rate being charged to all other classes of consumer. Cheap electricity for all purposes should be the persistent aim of every municipal electrical undertaking, and the cultivation of the vehicle charging load is a step on the way.

* Paper read yesterday at Caxton Hall before the International Municipal Electrical Association in London.

FOR OTHER ADVERTISEMENTS

See End of Paper.

THE URBAN DISTRICT COUNCIL OF HESTON AND ISLEWORTH.

TEMPORARY ASSISTANT SURVEYOR'S DEPARTMENT.

A Temporary Assistant is required in the Engineer and Surveyor's Department of the above Council during the duration of the war.

Candidates must be non-eligible for service in H.M. Forces, and be fully qualified in level and survey.

Preference will be given to candidates with experience in the preparation of a town planning scheme.

The salary will be at the rate of £3 3s. per week.

Applications, endorsed "Temporary Assistant," and accompanied by copies of not more than three recent testimonials, must reach the undersigned not later than noon, on Tuesday, the 29th June, 1915.

J. G. CAREY, Assoc.M.Inst.C.E.,
Engineer and Surveyor to the Council.

Council House,
Hounslow.
June 16, 1915. (2,606)

URBAN DISTRICT OF FINCHLEY.

OVERGROUND CONVENIENCE, EAST FINCHLEY.

The Council of the above District invite Tenders for the Erection of an Overground Convenience in East End-road at the rear of the "Bald-faced Stag" Public-house.

The Drawings and General Conditions of Contract may be seen, and copies of the Specification and Schedule obtained, on application to the Council's Engineer and Surveyor, Mr. C. J. Jenkin, M.Inst.C.E., at the undermentioned offices, on payment of a deposit of £3, which will be returned on receipt of a *bonâ-fide* Tender for the whole of the work, together with a fully priced-out Schedule, and the return of all papers supplied.

The Council does not bind itself to accept the lowest or any Tender.

Tenders, endorsed "Public Convenience, East Finchley," to be delivered to the undersigned not later than 12 noon on the 28th day of June, 1915.

E. H. LISTER,
Clerk of the Council.

Council Offices,
Church End, Finchley, N.
June 14, 1915. (2,607)

URBAN DISTRICT OF FINCHLEY.

HUMUS TANKS.

The Council of the above-named District invites Tenders for the Construction of Humus Tanks at its Sewage Farm in Summers-lane.

Plans and Conditions of Contract may be seen, and Form of Tender, Specification and Schedules of Quantities obtained, on application to the Council's Engineer at the undermentioned address.

A deposit of £2 will be required, which will be returned on receipt of a *bonâ-fide* Tender on the prescribed Form, together with fully priced Schedules and the return of all papers issued.

Sealed Tenders, endorsed "Humus Tanks," to be addressed to the undersigned, and delivered not later than 12 o'clock noon on Monday, the 28th June, 1915.

The Council does not bind itself to accept the lowest or any Tender.

E. H. LISTER,
Clerk of the Council.

Council Offices,
Church End, Finchley, N.
June 15, 1915. (2,608)

GLASGOW'S NEW BATHS AND WASHHOUSES

REINFORCED CONCRETE CONSTRUCTION.

[illegible] the Corporation of the district of [illegible] Glasgow [illegible] new baths and wash-houses [illegible] on the Great Western Road, the institution of the public

Ferro-concrete Roof over Corridor, Washhouses, Glasgow

baths and wash-houses, the plans for which were prepared by Mr. A. B. Macdonald, M.INST.C.E., the late city engineer of Glasgow. The accompanying photographic views illustrate the Monitor Hennebique roofs over the wash-house building, the main hall, the building being covered with roofs of 26ft. span, and the corridor roof having similar trusses of 10-ft. span. As will be seen by the illustration, the trusses are connected by [illegible] purlins of the same material. All details of the work were prepared by Messrs. L. G. Mouchel & Partners, of Westminster, who were represented during the execution of the contract by Mr. T. O. Dixon, their district engineer for Scotland. The contractors were Messrs. Gray's Ferro-Concrete Construction Company, Limited, of Polloksh[illegible]

Mechanical Filtration of Water.—We find that in our last week's report of the remarks made by Mr. Martin Deacon (London) in the recent discussion at Shrewsbury on the value of mechanical filters in the purification of water a mistake which materially affects the speaker's argument occurred. In the seventh line from the bottom of the first column of p. 742 the figure of £50 appeared instead of £500, and we hasten to make the necessary correction.

Upper Renfrewshire Roads.—In his annual report and estimate of the cost of maintaining the roads under his charge for the current year, Mr. Robert Drummond, road surveyor for the Upper District of Renfrewshire, states that the roads continue to improve in strength, and that on the main roads the coating of the new metal coatings with a bituminous binder is proving an economic factor, both as regards surface wear and the reduction of wear of the bottom material. The life of the surface is prolonged, and wherever roads have been strengthened the quantity of metal to be applied may in future with safety be reduced. The tar-spraying of road surfaces, together with the binding of new metal coatings with a bituminous mixture, was carried out with good results. About 70 miles of roads were dealt with, and the expenditure under this head was £4,345, in aid of which a grant of £1,600 was obtained from the Road Board. For the current year it is proposed to spend £4,450, and a grant in aid of £1,580 has been intimated.

ACCUMULATIONS OF HOUSE REFUSE.

THE FENCING OF VACANT LAND.

A [illegible] the Housing Committee of Morley, whereat the recent Local Government Board circular regarding the accumulation of house refuse in the neighbourhood of dwelling-houses [illegible] to be dealt with [illegible] and [illegible] councils, Mr. Long stated that he was considering the issue of another circular to all sanitary authorities urging special precautions for the prevention of disease during the summer months.

In reply to a suggestion that he should urge upon local authorities that they should compel local owners to fence land which was in immediate proximity to crowded areas, the right hon. gentleman said he had no reason to believe that there was any great difficulty in connection with the subject. He would consider it, but it was rather a large order.

A Glossary of Road Terms. By H. P. [illegible], M.INST.C.E. Bemrose & Sons, Limited, 23 Bedford Street, W.C. Price 2s. net.

During the past few years the progress [illegible] roads throughout the United Kingdom has rendered it necessary to correlate the nomenclature of road [illegible] and [illegible] has compiled a glossary with the hope that it may form a basis for such a correlation.—*Times Engineering Supplement.*

Ferro-concrete Roofing over Corridor

Pressure-Scraping Fifteen Miles of Water Mains.*

By JAMES MACFADZEAN, B.Sc., Assoc.M.Inst.C.E., Assistant Burgh Engineer, Ayr.

The main pipe scraping operations carried out by the Ayr Corporation which form the subject of this paper are not in any way unique, but the whole question is one which is interesting many engineers at present, and if this paper can bring about an interchange of ideas and experiences and prove helpful in any way to those who have similar operations in prospect, it will have served a useful purpose.

The chief source of the Ayr water supply is Loch Finlas, a natural lake, situated in the upper reaches of the Doon watershed, some 21½ miles south of Ayr. The drainage area is clean and free from moss, and the underlying rock belongs to the Silurian formation.

A single line of pipes conveys the water from Loch Finlas to a 7,000,000-gallon service reservoir near Dalrymple—a distance of 17 miles. The first 2½ miles consists of 18-in. diameter fireclay pipes, laid to a gradient of 1 in 350. The remaining 14½ miles is formed with cast-iron pipes, of which 8 miles are 16-in. diameter and 6½ miles 14-in. diameter, and it is with the scraping of these cast-iron pipes that this paper principally deals.

The main was laid in 1887, and had not previously been scraped. Its original calculated capacity, assuming a discharge at the level of the present service reservoir, which was not in existence then, was 2,592,000 gallons per day. It is only, however, since 1903 that reliable measured records of this capacity are available. In that year the maximum delivery was 2,037,000 gallons per day, but by 1911 this had fallen to 1,865,000 gallons, or a reduction in eight years of 8½ per cent.

Now this delivery was nearly 1,000,000 gallons per day short of the average daily requirement during certain periods in the summer, and the deficit had to be made up by pumping from a spring water source. The yield of these springs, although ample in the winter months, sometimes fell so low in summer as to be insufficient to meet this deficit, and the town had to be put on a reduced supply.

The need for increasing the supply at once was therefore imperative, and it was decided to scrape the main in the hope that the estimated increase of 500,000 gallons per day would be realised, and delay for a little the laying of a new main.

It was known that the pipes were incrusted, because of their decreased capacity, and also because quantities of nodules came away during scouring operations, and were found in the pipes when repairs were being executed.

The relative merits of power and pressure scraping were considered, and the power-scraping was set aside on account of the prohibitive cost, and the more serious dislocation of the supply which it would cause during operations, and also because every successive scraping would cost almost as much as the first. The incrustation was comparatively soft and easily detached, its thickness was small in comparison with the diameter of the pipes, and the head of water was generally ample; so that there seemed no reason why pressure-scraping should not give good results, and it was probable that this method would do less damage to the internal coating of the pipes. The type of scraper adopted was Messrs. Glenfield & Kennedy's, and the results show that it did its work well.

When the main was first laid no provision had been made for scraping, and the first step was to divide the system, by means of hatch-boxes, into sections of a convenient length, from 1 to 2 miles, according to conditions. Fortunately, the quickest bend had a radius of 18 ft., so that these did not require to be considered. There were two short stretches where a head of 15 ft. could not be relied on, and hatch-boxes were placed at the beginning and end of these, so that the scraper might be pulled through by means of ropes or chains.

It is very important to place all hatch-boxes in positions where a large volume of water can be easily disposed of without damage to roads, fields, or adjoining properties, and where they can remain open for hours at a stretch without causing serious inconvenience. In towns they should be enclosed in built chambers, sufficiently drained, and this is advisable, though not always necessary, in the country.

It is obviously undesirable to have any hatch-box placed so that the water from a long stretch of pipe will drain back into it, and it is very important that the control of the water entering any section should be exercised as near the beginning of the section as possible. The methods of controlling the flow of water into, and draining the water from, each section should be well considered beforehand, and extra valves inserted where necessary, and all scours put into good order.

It may here be mentioned that the work of inserting the hatch-boxes and also the scraping operations were very much simplified, because the main discharges into a service reservoir holding nearly three days' supply. This made it possible for the work to be carried out during the day-time. The hatch-boxes were put in, two at a time, on alternate days, under contract, the arrangement being that the water was not to be shut off for longer than six hours on each day. This time was only once seriously exceeded. On this occasion the river Doon rose suddenly after the pipe had been cut, entered the main through the open scour valves and flooded the work, and it was nineteen hours before the hatch-box was inserted and the water could be turned on again.

During the scraping operations it is necessary to keep spare lengths of pipes, collars, and jointing materials conveniently near, so that, in the event of a burst occurring, or the scraper having to be cut out, no time will be lost. It is also essential that, in any section which is being scraped all main valves be opened wide, so as not to impede the progress of the scraper, and all service connections shut down tight; otherwise they will become choked with the incrustation. Air valves must, of course, be kept open, although there is a danger that the efficiency of these may become impaired by the washing into them of material scraped from the pipes. They should be cleaned out after the operations are finished. The air valves on this system are of an old type, and are not provided with cut-off valves; therefore they could not be cleaned afterwards without again taking all pressure off the main.

The scraping of each section under pressure was carried out in the same way. The hatch-boxes at each end were exposed, and shear legs erected over each for lifting off the covers and raising and lowering the scraper. The water was then entirely cut off the section, which was drained dry by opening all the scour valves. The covers of both hatch-boxes were then removed; a plug was inserted in the second hatch-box to prevent any material being washed past it into the next section. The scraper was next placed in the first hatch-box, and the cover bolted securely down. The water was now turned on, and when the pressure behind the scraper was sufficient, it moved off with a low rumbling sound. The work was in the country, where there was little traffic, and as the weather was favourable there was not much difficulty in following the scraper by this sound, without stethoscopes, at all ordinary depths. One man walked alongside the scraper all the way, and several others were kept posted ahead at intervals to trace it should it escape from the first man. Men were told off to shut each scour valve as the scraper reached it, and to open up again after the scraper was home. It is usually important—especially if the drainage from the second hatch-box is not exceptionally good—to have the water shut off immediately the scraper has reached it. Sometimes a field telephone is used to send back word, but in this case a system of signalling was arranged, so that no time was lost in shutting off the water. The second hatch-box was then cleaned out, and the scraper carted back to its starting point for a second run. Each section was done twice, and the time allowed for having the water off on each day was six hours. It was found possible to have the water off every day for this work, and this was a great convenience, as it gave continuous employment to the men. The 16-in. scraper weighed 3 cwts., its average speed through the pipe was about 2 miles an hour, and the head required to drive it was about 15 ft. The steepest gradient climbed by the scraper was 1 in 9½ for a distance of 980 ft., and this was done without any difficulty whatever. It is hardly necessary to mention that good pumps must be kept handy for clearing the water from the hatch-boxes, and for any emergency work.

* Paper read at the Annual Scottish District Meeting of the Institution of Municipal and County Engineers at Ayr.

In the two sections where the pressure was low the same scraper was used, but it was pulled through by means of a chain. This method was naturally much slower than working by pressure, but the operations were much the same.

The scraping was done in two portions, the 14-in. pipes being scraped in May, 1912, and the 16-in. pipes in May, 1913, and as the scraping of the smaller pipes first was possibly a mistake it should be referred to. The reason for having the larger diameter main for the first 8 miles was to raise the hydraulic pressure line sufficiently to get over the high ground between Patna and Dalrymple. The result of scraping the 14-in. pipe first was, of course, to lower the pressure line where the change in diameter occurs. This fell so much that it dropped to the pipe level at one place and broke up the whole system from there to the service reservoir into a series of inverted syphons, and resulted in the supply being cut off from certain consumers on this section. These supplies could only be restored by closing down certain valves and throwing the pressure back on the main behind. It was therefore impossible to reap any advantage from the scraping until the whole of the main had been scraped.

Both the 14-in. and 16-in. scrapers were purchased, and are available for use whenever rescraping becomes necessary, but new leads and leathers will have to be purchased every time the operations are repeated.

As will be seen from Appendix No. 1, the cost of the scraping is low. If the hatchboxes, valves, scrapers, &c., are included, the cost per mile amounted to nearly £34 for the 14-in main, and £48 10s. for the 16-in. main. The actual scraping operations on the 14-in. main were done for £13 7s. 11d. per mile, and, owing to the experience gained during this work, the cost of scraping the 16-in. pipes was reduced to £11 19s. 9d. per mile. It should be understood that the cost of scraping depends largely on the obstructions met with, and the number of times the pipe has to be cut; but it is also important that the work be organised thoroughly, so that every man knows exactly what to do under any circumstances, and that all tools are at hand when required.

The immediate results of the operations were very satisfactory. The delivering capacity of the main was increased by 681,000 gallons per day, or 36¼ per cent, thus bringing it to within 46,000 gallons per day of its original calculated capacity. Another result, of equal importance, was the securing of an increase of 30 ft. in the pressure head at the point where the main changes size. This raised the hydraulic pressure line to a stable height above the pipe.

In May of this year, exactly two years after the scraping operations, a test was carried out, and the carrying capacity of the main was found to have decreased in this time by 276,000 gallons per day—that is to-say, 40¼ per cent of the increase obtained by scraping has already been lost. There has also been a decrease in pressure head of 25 ft. where the 16-in. and 14-in. pipes join. It would thus appear that the main will require to be rescraped next year, and if the consumption increases the intervals between scraping operations must be shortened until annual scraping is resulted, and a new main or a new source will become necessary.

It often happens, when a main is first scraped, that the scraper in its course meets with obstacles—such as pick heads, crowbars, jointing tools, and the lead from badly-run joints. In these operations, however, no lost property was discovered, and this is perhaps the main reason why the operations were carried through with hardly a hitch, and without any of the usual expedients having to be adopted to coax an unwilling scraper to keep moving. It is rather remarkable that, even in a certain stretch of over ½ mile, where the main runs through a floating moss, and where, every now and then, drawn joints had to be embraced in cast-iron clips, the scraper passed through without any hesitation.

If the scraper does become stuck, the first work is to locate it, then, by an induced water hammer, or by striking the pipe, or by finally floating down a wisp of hay behind the scraper, and repeating these methods, to endeavour to get it restarted. Failing all these means the main must be cut and the obstacle removed.

The material taken from the Loch Finlas main consisted almost entirely of well-formed nodules. They varied considerably in size, up to about ⅝ in. in thickness and 2½ in. in diameter, while here and there the nodules had become confluent, and formed a continuous layer of incrustation nearly ½ in. thick. The total quantity removed could not be gauged, as large quantities of nodules were blown from each scour, besides those carried forward with the scraper.

An analysis of the Loch Finlas water is given in Appendix No. 2, and that of a sample of the incrustation in Appendix No. 3. The water is very soft, and has an acid reaction, and contains no trace of iron. The nodules contain 72¼ per cent of iron oxide, obviously formed by the action of the water on the metal of the pipe. It is, in fact, corrosion of the pipe, with the addition of organic matter deposited from the water. Fig. 1 illustrates the growth of a nodule and the consequent deterioration of the pipe. The incrustation seems to have started in the centre, at a defect in the coating, and to have grown upwards and outwards in concentric layers. Simultaneous with this growth there appears to have been an eating into the metal. This action has been inwards at first, and then spreading outwards under the coating as the nodule increased in diameter,

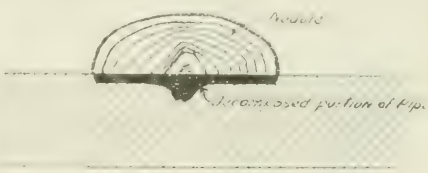


FIG. 1.—SECTION OF PIPE AND NODULE.

expanding and cracking the pipe coating in its course. This decomposed portion of the pipe, which is shown blackened in the figure, is darker in colour than the metal, and can be cut with a knife. Under a nodule of about 1½ in. in diameter the metal was decomposed for a depth of about $\frac{3}{16}$ in. at the centre, and $\frac{1}{16}$ in. over the rest of the area, but beyond the circumference of the nodule the pipe and coating were quite sound.

It would appear that, so long as each nodule is distinct, corrosion will continue at a fairly uniform rate, but after the nodules have united into a continuous layer the process will become slower as the thickness of the crust increases. Prof. J. Campbell Brown, in a paper before the Institution of Civil Engineers (Vol. 156 of "Proceedings"), stated that corrosion practically ceases when a thickness of 1 in. or 1½ in. is reached. This must depend, however, on the properties of the water and on the amount and quality of material deposited from it.

The wisdom of scraping a corroded main may well be questioned. In the present case it was done because the need of an increased supply was urgent, and the only other ways of obtaining it involved an immediate large capital expenditure. Before deciding to scrape a main the engineer should seriously consider whether the advantages to be gained will balance the deterioration due to more rapid corrosion, in addition to the cost of periodic scraping.

The solution of the problem of the corroded main would, of course, be a perfect pipe coating perfectly applied. This may come with the dawn of the Millennium, but meantime engineers, more especially those who are dealing with soft acid waters, would do well to pay more attention to the coating of pipes at the foundry. Double dipping and very careful supervision of the process might do much to prevent excessive corrosion and prolong the life of the pipes, and to a certain extent do away with the necessity of scraping. Suitable treatment of the water, such as neutralising its acidity by adding caustic soda or slight excess of lime, might make the action on the pipes less marked, but as waters vary so largely in all their characteristics, no general law can be laid down. Each supply has its own problem which must be treated by itself, and for whose proper solution the chemist should be associated with the engineer.

APPENDIX No. 1.

Costs of Scraping the Loch Finlas Main.

	14-in. main.	16-in. main.
Total length in miles	6·432	8·14
Total length in yards	11,320	14,327
Cost of hatchboxes, valves, scrapers	£131 10 10	£297 8 9
Cost of scraping pipes	86 3 0	97 11 8
Total costs	£217 13 10	£395 0 5

Inclusive cost per mile ...	£33 16 11 ...	£48 10 7
Inclusive cost per yard ...	4·615d. ...	6·617d.
Inclusive cost per yard per in. diameter	0·33d. ...	0.414d.
Cost of scraping per mile ...	£13 7 11 ..	£11 19 9
Cost of scraping per yard ...	1·826d. ...	1·635d.

The total cost per 1,000 gallons increase in daily supply was:—

Inclusive	18s.
Scraping alone	5s. 4¼d.

Appendix No. 2.

Analysis of Loch Finlas Water.

	Grains per gallon.
Total solid matter in solution	3·92
Chlorine	0·84
= Sodium chloride	1·38
Free ammonia...	0·0035
Albuminoid ammonia	0·0055
Oxygen required to oxidise organic matter ...	0·42
Total hardness ... ... 0·84 degrees.	

Appendix No. 3.

Analysis of a sample of Incrustation removed from the Loch Finlas Cast-iron Water Main.

	Per cent.
Peroxide of iron	70·00
Protoxide of iron	2·57
Alumina...	0·49
Carbonic acid	1·12
Phosphoric acid	0·43
Sulphuric acid	0·56
Silica	0·36
Water and organic matter	24·42
	99·95

SOME RECENT PUBLICATIONS.*

A Treatise on Hand Lettering. By Wilfrid J. Linehan, B.Sc., M.Inst.C.E., &c. Price 7s. 6d. nett. London: Chapman & Hall, Limited.

This book is intended as a complete manual of lettering for those for whom it has been written, the object of the author being to supply a series of alphabets suitable for mechanical, electrical, constructional and civil engineers, architects and architectural draughtsmen. It extends to some 268 pages on art paper, and is much more than a mere copybook, inasmuch as each alphabet is accompanied by clear instructions as to the best methods of forming the several letters, and as to the uses for which the particular style is appropriate. Moreover, all the exercises are carefully graduated, the letters in many cases being arranged, not alphabetically, but in order of difficulty. The usefulness of the work is greatly increased by the device of printing the instructions and exercises on opposite pages, so that the former may be read by the student while copying the latter. The book is the most complete of its kind that we have seen, and it should attain considerable popularity among students and draughtsmen.

Structural Steel Drafting and Elementary Design. By C. D. Conklin, junr. Price 10s. 6d. nett. New York: John Wiley & Sons; London: Chapman & Hall, Limited.

This work is intended as a text-book from which the draughtsman can obtain information upon the practical method of preparing shop detail drawings. The earlier chapters, which are of a general character, are followed by careful descriptions of the design and detail of several typical structures—as, for example, a steel roof, a deck plate girder railway bridge, a country highway bridge, &c. In each case the method of design is explained, and the necessary shop detail drawings are reproduced. The designs given are those most commonly met with in actual practice, and they form the basis of an excellent course in structural design and drawing for the technical school, according to American practice.

Valuations. By Samuel Skrimshire, F.S.I. Price 10s. 6d. nett. London: E. & F. N. Spon, Limited.

In the first place it must be pointed out that this is a text-book, and not a table-book. It is comprehensive in scope, including, as it does, valuations for the purpose of the sale and purchase of freehold, lifehold, copyhold, and leasehold property, assessments to duties under the Finance (1909-10) Act, 1910, the enfranchisement of copyhold estate, assessments for rating, compensation on compulsory purchase, and advances on mortgage. Intended primarily for students, a feature of the work is the large number of practical illustrations that it contains, very useful critical notes being appended to many of the solutions given. We can confidently recommend the book as an accurate and clear statement of the principles and practice of valuation, carefully graduated so as to meet the requirements of the learner.

Constant-Voltage Transmission. By H. B. Dwight, B.Sc., &c. Price 5s. 6d. nett. New York: John Wiley & Sons; London: Chapman & Hall, Limited.

In this book the author discusses the use of synchronous motors for eliminating variation in voltage in electric-power systems. His avowed purpose is to urge that more synchronous motors should be installed in alternating current power systems, but he has, nevertheless, sought to show impartially both sides of the case, and to outline the conditions to which the new method which he advocates is not applicable.

Timber. By William Bullock. Price 1s. 6d. nett. London: Sir Isaac Pitman & Sons, Limited.

This book forms one of the publisher's series of works dealing with the common commodities of commerce. Being intended for popular consumption, the author has wisely eliminated technical and scientific terms as far as possible, and confined himself to those timbers which are at the present time dealt with in ordinary commerce. He gives a very interesting account of the several varieties of timber from the time when they leave the forest to their actual use in commerce. In the concluding chapter a warning is uttered as to the necessity for tackling the problem of reafforestation, for, although actual shortage has not yet been felt, the demand continues to increase, while the sources of supply are slowly, but surely, being used up. The book is most readable and instructive.

Improved Four-figure Logarithm Table. By G. C. McLaren. Price 1s. 6d. nett. London: Cambridge University Press.

These four-figure tables are conveniently arranged on the thumb index principle, and the introduction clearly explains their use in the simplification of the processes of multiplication and division.

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

WAR AND DISEASE.

THE PREVENTION OF EPIDEMICS.

In the House of Commons, on the 10th inst., the Secretary of State for Foreign Affairs was asked whether any international, precautionary, or preventive measures were being taken, or instructions issued, against the danger of plague, cholera, or other rapidly spreading disease arising from the war; and, if not, whether the most competent medical advice on the subject would be obtained and made public at the earliest possible date.

The Under-Secretary of State for Foreign Affairs (Lord Robert Cecil), who replied, stated that discussions were in progress between French and British experts as to the measures to be taken for the prevention of epidemics, and the civil population would receive ample warning and advice should any danger arise.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

ANNUAL SUMMER CONFERENCE.

The annual summer conference of the Association of Managers of Sewage Disposal Works will be held at Leeds on Saturday, July 10th, at 10.30 a.m.

Dr. H. Maclean Wilson, M.D., B.Sc., will deliver his presidential address.

Mr. Geo. A. Hart, M.Inst.C.E., will give an explanation of the works included in the main drainage and sewage disposal scheme—illustrated by cartoons.

Mr. John T. Thompson, M.Sc., will read a paper, "Seven Years' Experience with a Large Sludge Pressing Plant": discussion.

Visit to the Leeds sewage disposal works.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President Mr. J. S. Pickering, M.Inst.C.E., Borough Surveyor and Water Engineer, Cheltenham.

ANNUAL GENERAL MEETING.

The forty-second annual general meeting of the institution will be held at the Institution of Civil Engineers, Great George-street, Westminster, on Thursday and Friday, June 24th and 25th, followed by visits on Saturday, June 26th.

[The full programme will be found in The Surveyor of June 4th.]

TOWN PLANNING.

On Thursday next, at 12 noon, an informal discussion on town planning will be held at the Institution of Civil Engineers. Mr. Raymond Unwin (town planning assistant, Local Government Board) will be present. This discussion will not be reported.

A selection of maps and plans, &c., will be exhibited in the room.

J. W. Dudley Robinson,
Secretary.

ROYAL SANITARY INSTITUTE.

YEOVIL MEETING.

At Yeovil, on July 14th, a discussion on "Water Supplies to Rural and Small Urban Areas" will be opened by Dr. W. G. Savage, county medical officer of health of Somerset.

NATIONAL ROAD CONFERENCE AND EXHIBITION, 1915.

PROGRAMME.

The following are the arrangements for the forthcoming Road Conference and Road Exhibition in London organised by the County Councils Association:

Friday, June 25th.

4 p.m.—Official opening of the exhibition at the Royal Horticultural Hall, Vincent-square, S.W., by the Right Hon. Walter Long, M.P., President of the Local Government Board.—Chairman, The Right Hon. Henry Hobhouse.

Monday, June 28th.

2.30 p.m.—Conference on "The Use of Tar, Pitch and Bitumen in the Construction and Maintenance of Roads, with special reference to the subject of Corrugations." Papers by Mr. Percy J. Sheldon, M.Inst.C.E., county surveyor, and Mr. Alfred J. Lyddon, Assoc.M.Inst.C.E., deputy county surveyor, of Essex, and by Mr. G. H. Jack, county surveyor of Herefordshire.—Chairman, The Mayor of Westminster.

Tuesday, June 29th.

2.30 p.m.—Conference on "Heavy Traffic." Papers by Mr. Harcourt E. Clare, clerk of the Lancashire County Council, and Mr. Ernest J. Elford, M.Inst.C.E., M.I.Mech.E., borough engineer and surveyor of Southend-on-Sea.—Chairman, Colonel G. Dixon.

Wednesday, June 30th.

2.30 p.m.—Conference on "The Classification of Roads." Paper by Mr. G. Montagu Harris, M.A., Barrister-at-law, secretary to the County Councils Association.—Chairman, Sir W. Ryland D. Adkins, M.P.

Thursday, July 1st.

2.30 p.m.—Conference on "The Reconstruction of Roads in Belgium, with general reference to the injury done to roads by war operations and military traffic." Paper by M. Henri Vandervin, Ingenieur en Chef Directeur des Ponts et Chaussées de Belgique.—Chairman, His Excellency the Belgian Minister.

The conferences will be held in the Lecture Room at the Horticultural Hall, on the first floor.

The exhibition will be open every day from June 25th to July 1st inclusive (with the exception of Sunday), from 10 a.m. to 7 p.m.

APPOINTMENTS VACANT.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

SANITARY INSPECTOR.—June 21st.—Corporation of Mansfield. £100—£140 per annum.—Mr. J. Harrop White, town clerk.

ROAD SURVEYOR.—June 23rd.—Denbighshire County Council. £100 per annum, with travelling expenses.—Mr. W. R. Evans, clerk, County Offices, Ruthin.

WORKS INSPECTOR.—June 25th.—Rhondda Urban District Council. £130 per annum.—Mr. E. H. Barber, engineer and surveyor, Pentre, Rhondda.

TEMPORARY ASSISTANTS.—June 28th.—Corporation of Chesterfield. £80 a year.—Mr. H. A. Bridge, acting borough surveyor.

SANITARY INSPECTOR.—June 28th.—Lewisham Borough Council. £150 a year.—Town Clerk, Town Hall, Catford, S.E.

TEMPORARY SURVEYING ASSISTANT.—July 1st.—Gelligaer Urban District Council. £120 a year.—Mr. Frank T. James, clerk, Hengoed, Glam.

TEMPORARY CLERK.—Corporation of Cheltenham.—Borough Engineer, Municipal Offices, Cheltenham.

SANITARY INSPECTOR.—Finsbury Borough Council. £3 per week.—Medical Officer of Health, Town Hall, Rosebery-avenue, London, E.C.

DRAUGHTSMAN.—Public Works Department, Government of the Gold Coast. £250—£300.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ASSISTANT ENGINEERS.—Public Works Department, Government of the Gold Coast. £350—£400.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

DRAUGHTSMAN.—Survey Department of the East India Protectorate. £160—£205 a year.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL CONTRACTS OPEN.

Official and similar advertisements received up to 4.30 p.m. on Thursdays will be inserted in the following day's issue, *but those responsible for their despatch are recommended to arrange that they shall reach* The Surveyor *office by noon on* Wednesdays *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

COCKERMOUTH.—June 21st.—For rebuilding a retaining wall, for the Gas Committee.—Chairman of the Gas Committee.

GLAMORGAN.—June 21st.—For the erection of playsheds at certain schools, for the county council.—Glamorgan County Hall, Cardiff.

LEEDS.—June 21st.—For the erection of a two-story building, for the corporation.—Town Clerk.

PLYMOUTH.—June 21st.—For alterations and repairs to No. 34 Exeter-street, for the corporation.—Mr. J. Paton, borough engineer and surveyor.

ROCHDALE.—June 22nd.—For the reconstruction of a turret at the assembly hall, for the corporation.—Mr. P. W. Hathaway, Town Hall.

SHREWSBURY.—June 22nd.—For building concrete block boundary wall and forming footpath, for the corporation.—Mr. A. W. Ward, borough surveyor.

MANCHESTER.—June 23rd.—For the reconstruction of a bridge, for the corporation.—City Surveyor.

CLAREMORRIS.—June 23rd.—For the erection of cottages, for the rural district council.—Mr. M. Cosgrave, architect.

BLACKPOOL.—June 23rd.—For excavating and underpinning at the electricity works, for the corporation.—Mr. John S. Brodie, borough surveyor.

DURHAM.—June 25th.—For taking down and re-erecting two iron schools, for the Education Committee.—The Clerk, Shire Hall, Durham.

KENT.—June 25th.—For repairs to schools, for the Education Committee.—Mr. W. H. Robinson, architect, Sessions House, Maidstone.

KENT.—June 25th.—For repairs to schools, for the Education Committee.—Mr. W. Robinson, architect, Sessions House, Maidstone.

WILTS.—June 25th.—For alterations and repairs to various schools, for the Education Committee.—Mr. J. George Powell, county surveyor, Trowbridge.

BRIERFIELD.—June 26th.—For the erection of two retaining walls, for the urban district council.—Mr. B. Halstead, surveyor.

LEYTON.—June 29th.—For cleaning, painting and repairing various schools, for the Education Committee.—Mr. W. Jacques, 2 Fen-court, Fenchurch-street, E.C.

CONWAY.—June 29th—July 5th.—For the construction of steel girder bridge and approaches, and laying mains, for the Colwyn Bay Joint Water Supply Board.—Mr. C. F. Farrington, engineer, Trinity-square, Llandudno.

HOMERTON.—June 30th.—For repairs and cleaning at hospital, for the Metropolitan Asylums Board.—Mr. W. T. Hatch, engineer, The Embankment, E.C.

LONDON.—June 30th.—For repairs and cleaning works at Homerton Asylum, for the Metropolitan Asylums Board.—Board Offices, Embankment, E.C.

BOOTLE.—June 30th.—For alterations to offices and sheds at the town hall yard, for the corporation.—Borough Engineer.

GODALMING.—June 30th.—For the erection of a sanatorium, for the Metropolitan Asylums Board.

WREXHAM.—July 8th.—For redecorating and painting certain buildings, for the corporation.—Mr. J. England, borough engineer, Willow-road.

ALDERSHOT.—For the re-erection of a temporary hospital. Offers invited from owners of wood or iron buildings.—Mr. F. C. Uren, surveyor.

BOOTLE.—For alterations to school lavatories, for the corporation.—Borough Engineer.

Gas and Electricity.

EDINBURGH.—June 21st.—For the supply of two 5,000-kw. turbo-alternators and condensing plant, for the corporation.—The Engineer, Dewar-place, Edinburgh.

BIRKENHEAD.—June 30th.—For the supply of a gas condenser and gas washer, for the corporation.—Gas Engineer, Gasworks, Thomas-street.

Engineering: Iron and Steel.

MOTHERWELL.—June 21st.—For excavations in connection with laying of gas mains, for the corporation.—The Gas Engineer, Mill-road, Motherwell.

MAESTEG.—June 21st.—For the construction of a retaining wall, carriageway, footway and four-stall urinal, for the urban district council.—Mr. S. J. Harpur, engineer.

DUNDEE.—June 23rd.—For the supply of steel rails, for the Harbour Trustees.—Mr. J. H. Thompson, general manager and engineer.

RHONDDA.—June 25th.—For the supply of wrought-iron tubes and ironmongery, for the urban district council.—Mr. E. H. Barber, engineer and surveyor.

EASTBOURNE.—June 26th.—For the supply of cast-iron circulating water piping and valves, for the Electricity Committee.—Mr. J. K. Brydges, borough electrical engineer, Electricity Works.

BATTERSEA.—June 30th.—For the supply of iron castings, for the borough council.—Borough Engineer.

HALIFAX.—July 1st.—For the supply of electricity plant, for the Electricity Committee.—Mr. W. M. Rogerson, borough electrical engineer.

LLANDILOFAWR.—July 2nd.—For the construction of water supply, for the rural district council.—Mr. E. Jones, surveyor, Glancennen, Llandebie.

MADRAS.—July 14th.—For the supply of cast-iron pipes, special castings, sluice valves and hydrants, for the corporation.—Mr. J. W. Madeley, special engineer; agents, Messrs. James Mansergh & Sons, 5 Victoria-street, Westminster, London, S.W.

RANGOON.—August 11th.—For the installation of a system of fire alarms, for the municipality.—Messrs. Ogilvy, Gillanders & Co., 67 Cornhill, London, E.C.

Roads.

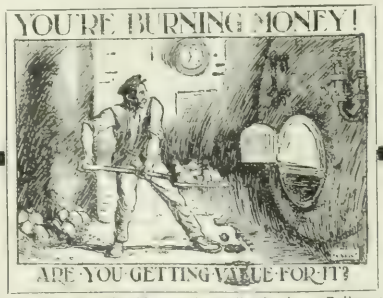
HALIFAX.—June 19th.—For private improvement works, for the corporation.—Mr. J. Lord, borough engineer.

REIGATE.—June 19th.—For repairing tar-macadam road and resurfacing with Trinidad Lake asphalt or similar material, Hatchlands-road, for the corporation. Borough Surveyor.

STEVENAGE.—June 21st.—For the supply of 800 tons clean chippings and dust, and broken Guernsey, Leicester, or other granite, for the urban district council.—The Surveyor.

GUILDFORD.—June 22nd.—For the construction of a road, for the rural district council.—Mr. J. Anstee, engineer, Commercial-road.

BROWNHILLS.—June 28th.—For tar-spraying 35,000 super. yds. of road and tar grouting, for the urban district council.—Mr. J. H. Shaw, engineer and surveyor.



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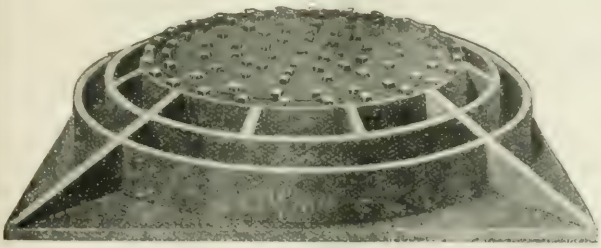
THE "GRIP" PATENT MANHOLE COVER.

Rounded edges avoided. A depth of 5in. of macadam gripped around the outer frame of the cover by the concentric rings shown.



SEWERAGE IRONWORK.

AS will be seen from the photograph, the concentric rings which form an integral part of the frame provide annular spaces in which the road material is not only held up, but becomes more and more consolidated in these spaces as it is compressed by the traffic. This has the effect of reducing the crumbling of the road material, and its wearing away from the vertical edge of the frame.

But road material will wear away eventually, and when it does the "GRIP" cover provides against the danger of abrupt edges. The concentric rings are graded in height, and if the road above them becomes worn they provide an inclined plane to the edge of the frame. It will be seen that we have avoided rounded edges, because with a curved edge the road material becomes so thin at its point of contact with the iron that it can only last for a very short time, and when it has worn a depression is left between the road surface and the iron, which is dangerous.

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June 25th to July 1st, 1915.

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The Right Hon. WALTER LONG, M.P., President of the Local Government Board will open the Exhibition.

The Belgian Minister, Monsieur PAUL HYAMS, will preside at the Conference on the Reconstruction of Roads in Belgium.

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London, S.W.

BASINGSTOKE.—June 30th.—For steam rolling, for the rural district council.—Mr. R. Forrester, surveyor, Chequers-road.

HALE.—July 7th.—For making up back passages, for the urban district council.—Mr. T. Blagburn, surveyor.

Sanitary.

TATTERSHALL.—June 21st.—For the construction of a sewer, manhole, gully, and settling tank, for the rural district council.—Council Office, 4 Church-lane, Horncastle.

BLYTH.—June 21st.—For scavenging the village of Carlton, for the rural district council.—Mr. A. E. Hewett, 78 Highland grove, Worksop.

BLEAN.—June 21st.—For the construction of stoneware pipe sewers and manholes, for the rural district council.—Mr. F. A. Ward, engineer, "Roseneath," Eddington, near Herne Bay.

SHEFFIELD.—June 23rd.—For the removal of house refuse and emptying closets, for the rural district council.—Mr. J. Stones, surveyor and inspector.

SAWBRIDGEWORTH.—June 24th.—For house scavenging, for the urban district council.—Mr. W. Morris, clerk.

CROYDON.—June 24th.—For the removal of house refuse, for the urban district council.—Mr. E. J. Gowen, clerk, Katherine-street, Croydon.

BROWNHILLS.—June 28th.—For laying 9-in. stoneware pipe sewer, for the urban district council.—Mr. J. H. Shaw, engineer and surveyor.

NEWPORT (I.W.).—July 5th.—For the removal of house and road refuse, for the corporation.—Mr. T. Ross Pratt, town clerk.

GRANTHAM.—For the construction of a surface-water sewer, for the corporation.—Borough Surveyor.

Stores.

INVERNESS.—June 21st.—For the supply of ironmongery, brasswork goods, lead pipes, special castings, cast and wrought ironwork, and the excavation and laying of gas mains, for the Gas Commissioners.—The Manager, Gasworks.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

CANNOCK. Accepted for the construction of conveniences, for the urban district council.—Mr. R. Blanchard, engineer:

Hacksley Brothers, Wellingborough, £354.

DARLINGTON. For the supply and laying of cast-iron condenser water pipes, for the corporation. The Borough Electrical Engineer:

Cochrane & Co., Middlesbrough.

ISLE OF WIGHT. Accepted for repairs and other work to a bridge, for the rural district council.—Mr. L. A. Cozens, surveyor.

Rousell & Son, Ventnor, Isle of Wight, £595

LAMBETH. For the execution of work in connection with the painting and cleaning of the infirmary, for the Board of Guardians:

A. H. Inns, Camomile-street, E.C.	£495
W. Smith & Sons, Harlesford-road, S.E.	464
Triggs & Co., Clapham, S.W.	459
J. Scott Fenn & Co., William-street, S.E.	418
H. Kent, Beacon-road, S.E.	397
Townsends & Co., Dean-street, W.	379
W. Chappell, Elgin-avenue, W.	349

The guardians have decided to take no further steps in the execution of the work for the present.

ROMFORD. For the supply of broken granite and granite chippings, for the urban district council.—Mr. H. T. Ridge, surveyor:

	1,200 tons. 1½ in. at per ton.	890 tons. ¾ in. at per ton.	225 tons. ¾ in. at per ton.	½ in. at per ton.
	s. d.	s. d.	s. d.	s. d.
J. Mowlem & Co.	16 0	13 3	14 6	14 6
Croft Granite, &c., Company	16 5	15 9	16 2	16 9
Brookes, Limited	16 6	13 6	14 6	15 0
Enderby and Stoney Stanton Granite Company	15 5	11 2	13 5	9 11
A. & F. Manuelle	15 9	13 6	14 3	14 9
Rowe & Mitchell	16 3	14 3	15 3	15 6
Johnston Brothers	15 7	15 7	15 7	15 7
W. Griffiths & Co.	14 10 / 15 3	14 8	15 5	15 8
Buxton Lime Firms Company		11 10	13 4	13 4
United British Basalt and Road Company, Ltd., Buxton	13 6	14 6	15 0	14 6

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The Surveyor

And Municipal and County Engineer.

Vol. XLVII. JUNE 25, 1915. No. 1,223.

Minutes of Proceedings.

Municipal Engineering War-time Appointments.

In our last issue (p. 762) we noted that the Local Government Board had expressed their view that when vacancies for municipal engineering officers occur, and it is unlikely that candidates suitable for permanent appointment who are not eligible for the Army or for special work in connection with the war can be obtained, the local authority should consider first whether it would be possible by a rearrangement of duties among other officers to avoid any fresh appointment during the period of the war; and that if this should be found impracticable they should endeavour to secure the services of any retired officer with the requisite experience who might be able and willing to act during that period. We have before us a letter from one of the ablest of our retired civic engineers, who is quite willing to offer his services for the duration of the war, but, he adds, "As I cannot very well advertise my willingness . . . what can I do?" In the hope that we may be of some service in bringing together retired engineers and the local authorities who need their help, we are opening a register of men similarly desirous of assisting local authorities temporarily, and we ask such as are qualified to send us their names and the names of the districts they last served. At the same time local authorities who wish to avail themselves of assistance as suggested by the Local Government Board are asked to make their requirements known to the Editor of "The Surveyor," Bride-lane, Fleet-street, London. The names of those who offer their services will not be published in our columns, but the list will be sent direct to local authorities who have vacancies to fill.

* * *

The Incorporated Municipal Electrical Association.

At the annual convention of this body, which was held on Thursday and Friday last in London, an interesting report on the practical working of the "Point Five Tariff" was presented by Messrs. A. S. Blackman and Thos. Roles, the chief electrical engineers of Sunderland and Bradford respectively. It may be explained that the quaintly named tariff in question consists in a charge of 0·5d. per Board of Trade unit, usually but not always combined with a fixed annual or quarterly charge based upon the rateable value of the house or upon the amount of electrical apparatus installed, and the tariff applies only to private residents. Both of the authors employ the rateable value of the house as the basis for the fixed charge, but they use [illegible] reports received from users of alternative methods. They agree in enthusiastically recommending the system as a most valuable aid to their undertakings, and show that it is welcomed by consumers, the number of whom in each town has greatly increased since its introduction. One of its most useful features is the fact that it enables a consumer to estimate very closely what his bill for electricity will be, and it is readily understood—which is not the case with the maximum-demand system. Another advantage is that, as all units are charged for at the same rate, no matter what they are used for, there is no need for installing a separate meter and wiring for the adoption of electric heating and cooking at a lower price than lighting. Again, as additional units make very little difference to the total charge, the consumer has every inducement to employ electricity for heating and cooking, and to increase his lighting installation, with beneficial results to the supply station, which also gains the advantage of an improved load factor. The majority of new consumers adopt the point five tariff, and most of the older ones have changed over to it; and contractors regard it with emphatic approval as a valuable aid to business.

A report on the use of electric vehicles in municipal service — some extracts of which appeared in our last issue—was submitted by Mr. F. Ayton (Ipswich), honorary secretary of the Electric Vehicle Committee, and contains information of much value to surveyors and borough engineers. The vehicles referred to are driven by storage batteries, and are noteworthy for the simplicity of their mechanism and the ease with which they can be handled by anyone with very little training. But their chief recommendation is the economy of working which is claimed for them as compared with either horses or petrol-driven vehicles, while they are reported to have proved most reliable in service and inexpensive to maintain. Glasgow Corporation Electric Supply Department, for instance, found that their first electric van did the work of two horses at less cost, and compared with a petrol van previously used by the department showed a saving of no less than £240 per annum, and three more electric vehicles have now been ordered. A well-known London stores employs fifty-five electric delivery vans because they are cheaper

than horses. Seventeen municipalities in this country are using or are about to use electric vehicles. Large numbers are employed in Continental cities for collecting house refuse—the municipality of Paris possesses no fewer than 100 for this purpose. For ambulance work the electric vehicle is ideal; several London authorities use electric ambulances, and a number of English fire brigades have adopted battery vehicles of various types. Electric battery omnibuses are also employed by several British municipalities in conjunction with their tramways.

The annual convention of the association should have been held this year at Dundee, but the president, Major H. Richardson, city electrical engineer, was called to the Colours, and it was decided to hold only the necessary annual meeting in London, with Mr. A. C. Cramb (Croydon) as acting president, and the usual social functions were abandoned. Under the circumstances there was a moderate attendance, and the business was confined to the report of the council and similar matters. The report of the council shows that a great deal of useful work has been accomplished during the past year in connection with a variety of important questions. The subject of standardisation has received especial attention, and the association has cordially co-operated with other bodies in this matter. The Development Committee and the Electric Vehicle Committee have been very active, and it is clear that the association is vigorously promoting the development of the supply and utilisation of electricity in this country.

* * *

Water Supplies from the Chalk.

Probably the chief source of the water supply of this country is the chalk, and the value of all fresh evidence in relation to water derived from that formation is sufficiently apparent. Special interest therefore attaches to the two excellent papers which were read before the Institution of Water Engineers on Friday last, and which deal respectively with "The Effect of Springs upon Water Levels in the Chalk of East Surrey," and with the "Hydro-geological Conditions at Newbald, East Yorkshire"—*i.e.*, at the escarpment of the chalk forming the East Yorkshire Wolds. In both cases the flow of water in the chalk is discussed, and although the conditions dealt with by each author are entirely different, the remarks in each case tend to show the importance of springs in relation to the flow and level of water in the chalk. Mr. Henry Dewey, the author of the paper dealing with East Surrey, shows very clearly that the dip and character of the beds of chalk in the district dealt with do not appreciably affect the water level, but that the exhaustion of the water caused by the many powerful springs at Ewell, Carshalton, and Waddon tends to lower the water level permanently on one side of the district. There are here two contiguous areas in which the movements of the subterranean waters differ in a marked manner. This is evidently due to the emission of springs in the one area and to their absence in the other. It is generally accepted that water follows the line of least resistance, and, flowing through the fissures in the chalk, that the effect of a spring or of excessive pumping causes a depression in the water level at the point where the water is exhausted, and that the water gradient ascends from that point. The investigations of Mr. Dewey and a map which he has prepared showing the water levels in East Surrey will be duly appreciated by the water engineer.

Mr. Percy Griffith, the author of the paper dealing with East Yorkshire, shows very clearly the manner in which a water supply problem of considerable difficulty should be dealt with, and it is greatly to be desired that the paper should be read by members of boards and authorities who are responsible for water undertakings, for they would then grasp the importance and value of work being dealt with in a scientific manner, and would understand more clearly than is sometimes the case the need for sufficient experimental work and preliminary investigation before spending money upon some large undertaking which may later prove to be a failure. Mr. Griffith first proved that the most obvious source of supply and a gravitation scheme would be more expensive than a pumping scheme, and that by raising the water 100 ft. the cost of the mains would be so reduced as to more than cover the cost of the pumping. A trial boring made in the chalk, and a trial well and headings, proved that the expected flow of water in the chalk was insufficient. It was then observed that, owing to the erosion of an impervious stratum overlying the oolitic limestone, the natural drainage of the local chalk area was passing freely into the fissured limestone, and that the water held in this limestone formation burst up where the overlying impervious layer was too thin to stand pressure, and thus formed springs. It was thus argued that a boring carried into the limestone would tap a larger supply. The boring was then made, and has proved to be absolutely successful. The manner in which this supply was obtained reflects the greatest credit on the diligence and ability of the engineer. The source of the water was undoubtedly the chalk. The chalk was its gathering ground, and yet a well in the chalk could not gather it, clearly because it was escaping by means of a subterranean outlet into the limestone. Feeling certain that the water must be there, the engineer had the courage of his convictions, and, by careful rearranging and sufficient experimental work, was enabled to find it. The two papers are dealt with elsewhere in these pages, and will form a most valuable addition to the published records of the Institution of Water Engineers.

* * *

Co-operation in Town Planning.

Success in the inauguration and execution of a town planning scheme depends so much upon a good understanding between the local authority and the landowners that the Local Government Board have from the first insisted upon the importance of conferences for the free discussion of points of conflicting interest. At these conferences both local authority and landowner are usually represented by their surveyors, and the successful development of a scheme will depend to a very great extent upon the establishment of a spirit of mutual concession and co-operation, the surveyors respectively acting for the public authority and representing the private interest. Some of the means by which this desirable result may be attained are suggested in the circular on the subject recently issued by the councils of the Surveyors' Institution and the Institution of Municipal and County Engineers, and reproduced in our last issue. In that circular it is specially pointed out that it is of the utmost importance to reconcile the various interests affected, and that this can most effectively be done by conferences being held between the officers of the local authorities on the one hand and the advisers of land and property owners on the other, both in the earliest and in subsequent stages of the preparation of a scheme, so that, as far as possible, there may be agreement on the main principles before the final Local Government Board inquiry takes place. To this end, and in order to facilitate the interchange of opinion and information, the councils of the two institutions have arranged that, if the officers of local authorities will notify the secretary of the Institution

of Municipal and County Engineers when they are about to prepare schemes, he will supply the secretary of the Surveyors' Institution with the necessary information for communicating to members of that body likely to be concerned, so that such engineering matters may get into touch with each other.

* * *

The Annual Meeting.

The earlier part of the excellent address delivered yesterday by Mr. H. T. Wakelam, the county engineer of Middlesex, on the occasion of his installation as president of the Institution of Municipal and County Engineers, contained some observations on the relation between theory and practice in the education of an engineer which are well worthy of attention. The measure of a man's theoretical knowledge may be proved by his examination successes, but practical experience can only be obtained in the workshop and on works of construction. It follows that it should be the aim of those who conduct engineering examinations to make them as practical in character as possible, and this, in our view, is at once the justification for and the peculiar merit of the examinations which the institution holds from time to time. Continuing to address the junior members, the new president urged them to organise themselves by districts for the purpose of arranging visits to works in progress. In dealing with some of the more important matters which are comprised in the ordinary work of the municipal engineer, Mr. Wakelam pointed out that since the passing of the Public Health Act, 1875, a sum of more than £100,000,000 sterling has been expended in connection with the disposal of sewage and works of water supply in England and Wales alone. The justification for this enormous expenditure is to be found in the great reduction which has taken place in the death-rate, to say nothing of the improvement in the conditions in which the poorer members of the community live. These remarks naturally led to a reference to the housing question and the problem of the economic rent in rural districts. Mr. Herbert Samuel, the late President of the Local Government Board, took the view that, even if the agricultural labourer cannot afford to pay an economic rent for a newly erected cottage, there are others in every village —such as policemen, postmen, railwaymen and others—who can, and that if new cottages are built for this class of tenant the cheaper buildings in which they now reside will become available for their poorer neighbours. In Mr. Wakelam's opinion, with which we fully agree, this suggestion should receive the most careful consideration at the hands of local authorities and their advisers.

In present circumstances it was only natural that a large part of the address should have been devoted to the subject of roads, and in particular to the problems presented by the advent of the motor car. In this connection the members were reminded that the Government decided a short time ago to appoint two committees—one to consider the technical aspect of the question of damage to roads by motor vehicles, and the other to consider the wider question as to the proper payment, if any, to be made by their owners towards the upkeep of the roads they use. We have frequently had occasion to express our views on both of these questions, and we need therefore say no more at the present moment than that we agree that road authorities have no desire to throttle trade in any way, and that their only legitimate interest is to secure a settlement which shall be fair and equitable as between the road user on the one hand and the ratepayer on the other. A most interesting part of the address was that in which the president dealt with the economic aspect of road work. In view of the fact that every single additional penny expended per square yard per annum on the maintenance of the roads of England and Wales, added to the roads bill, means an additional million of money to be annually found by the ratepayer, the point of "cost *v* life" of road materials will be seen to be the most important monetary factor to be considered in connection with local government. A reference to the close connection which exists between arterial roads and town planning concluded an address which was a worthy inauguration of what it is confidently anticipated will be a successful year of office.

* * *

The Orphan Fund.

As has been usual for some years now, the annual meeting of the institution was made the occasion of a gathering of subscribers to the Orphan Fund. This fund, which is deserving of much wider support than has been accorded to it hitherto, owes an incalculable debt to Mr. O. Claude Robson, who has acted as its honorary secretary and treasurer from the first. The report of the past year's work is satisfactory inasmuch as it shows that the income has not been adversely affected to any great extent by the abnormal conditions that have prevailed. On the other hand, the number of subscribers (210) is lamentably small compared with the number of members of the institution. This state of affairs will not be remedied until the general body of members realise that in a work of this kind an income derived from a wide constituency of small subscribers is of much greater value—and represents a larger amount of sympathy —than the same income received from a few large subscriptions. During the year twenty-two children have received grants, and wise administration has led to the maintenance of financial soundness. It gives us great pleasure once again to have an opportunity of commending the fund to the sympathetic consideration of our readers, and of congratulating Mr. Robson and the committee on the continued success of their charitable efforts.

* * *

Land Values and Road Widenings.

A difficulty has arisen between the Norfolk County Council and Sir Samuel Hoare with regard to the terms upon which a strip of land shall be given up for the purpose of widening a road known as Sidestrand road. The land in question is purely agricultural in character, and the portion required is some 500 yds. in length and of a width varying from 8ft. to 10ft. It appears from a report of the Eastern Highways Committee, which appears in the *Eastern Daily Press*, that Sir Samuel Hoare had been asked to give up the land on the same terms as had been accepted by other landowners in the neighbourhood, namely, that the new frontage should be fenced and made good at the public expense. In reply to this suggestion, Sir Samuel Hoare has written a letter in which he says that he has definitely decided that, when land is assessed and taxed at a certain value by one public body (the Inland Revenue), he is not prepared to give it away for nothing to another public body (the county council). We are not concerned with the local dispute, except in so far as it raises a question of principle. In our view the value put upon land for the purposes of Imperial taxation is not necessarily the measure of compensation to which the owner is entitled when it is required for a public improvement of this character. One obvious distinction is that the widening of a road usually enhances the value of the land fronting on the more commodious highway, and for that reason is often undertaken at the request of a landowner who is desirous of developing his estate. Sir Samuel Hoare is by no means the first landowner to put forward the argument implied in his letter, but we are bound to say that we cannot see that such a contention is well founded.

Hydro-Geological Conditions at Newbald, East Yorkshire.*

By PERCY GRIFFITH, M.Inst.C.E., F.G.S., &c.

The purpose of this memoir is to explain the somewhat peculiar geological conditions of the district around Newbald—that is, at the escarpment of the chalk forming the East Yorkshire Wolds—so far as they affect the question of water supply.

The investigations herein described were carried out for the purpose of obtaining a suitable source for the water supply of the rural district of Howden, and some particulars of the requirements to be provided for are therefore given.

This district comprises an area of about 150 square miles of flat agricultural land lying on the north side of the rivers Ouse and Humber, immediately opposite the mouth of the river Trent. The whole area is but sparsely populated, the only town included in the district being Howden, with a population of 2,000. The remaining inhabitants (numbering about 10,000) are distributed among widely scattered villages, the chief industry being agriculture. A large part of the area is intersected by "warping drains," and, being periodically flooded with tidal water from the rivers Ouse, Derwent and Humber, is extremely fertile. On the other hand, the natural supply of water suitable for potable and "domestic" use is very scanty, and for many years past the question of providing a general public water supply has been the subject of serious consideration.

Appointed at the end of the year 1911 to advise the council upon the question, the author has since been engaged in preliminary investigations and reports and in carrying out experimental works, and in March of the present year (1915) was able to prove by exhaustive tests the existence of an ample supply of excellent water at a point about 1 mile south of the village of North Newbald.

The great bulk of the rural district is composed of low-lying marshy land, but at the extreme eastern boundary the limits extend (for a distance of 1½ miles, measured from north to south) 2 miles eastwards of the low-lying land, and this extension brings under the control of the Howden Council an area of 3 square miles of the chalk "wolds," immediately adjacent to which are two large springs (known as "Drewton" and "Weedley" springs), which form the source of a stream known as "Drewton Beck."

. The fact that such an excellent supply of water existed on the border of the council's area did not, however, go far towards making the supply available for the general use of the inhabitants; indeed, the very earliest steps taken towards this end brought to light difficulties which proved practically insurmountable. The Drewton Beck, although not more than 10 miles in length, traverses land divided among a large number of different owners, besides affording a convenient (if not very safe) source of supply to the inhabitants of a village known as North Cave, through which it passed. Enquiries of a preliminary character showed that the use of the spring forming the source of this stream for a public waterworks would be strenuously opposed by the riparian owners and others, and that to secure the necessary authority to do this the Howden Council would have to secure a special Act of Parliament. A Provisional Order of the Local Government Board, under the Public Health Act, 1875, would have sufficed for the compulsory purchase of land, but not for the purchase of water rights. At this juncture it was realised that a rural district council has no statutory authority to promote private Bills, and that, in the event of such a Bill failing to pass into law, the members of the council would be liable to be surcharged with the expenditure incurred, subject only to the discretion of the Local Government Board to remit the surcharge if they thought fit. As in any event the cost of the scheme must involve the council in very heavy outlay, upon which the water rates alone would be quite inadequate to meet the interest and redemption charges, it will be readily understood that the council refused to face the additional risk of being made personally responsible for Parliamentary expenses. It will also be seen how keenly the Howden Council were interested in the Public Health Act, 1875, Amendment (Acquisition of Water) Bill, promoted by the Local Government Board in the year 1913, but withdrawn for want of time. This Bill (which seems to the author a very desirable measure in the public interest) would have enabled rural district councils compulsorily to purchase water rights by Provisional Order, and would therefore have overcome the difficulty in which the Howden Council were at this juncture placed.

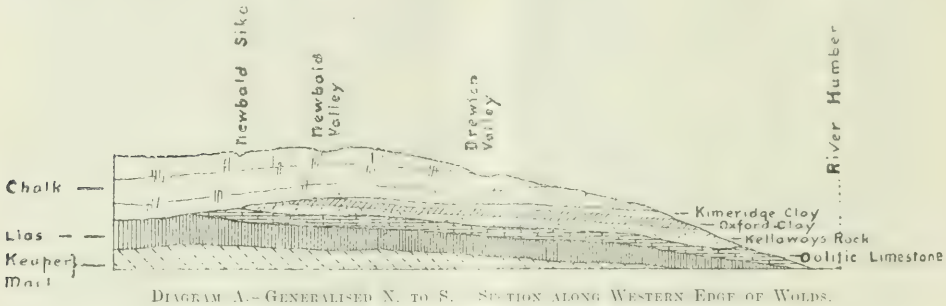


Diagram A.—Generalised N. to S. Section along Western Edge of Wolds.

Reproduced and enlarged from Geological (Water Supply) Memoir.

Further procedure in this direction being impossible, the author considered other possible sources, in the first place with a view of intercepting the water overflowing at the Drewton and Weedley springs at some point underground where the riparian owners would have had no claim for protection. It must here be explained that the clay underlying the chalk, which forms the overflow for the chalk water, outcrops at a fairly constant level of 175 above ordnance datum, and that consequently, if a sufficient supply could be tapped at any point along this outcrop, it would flow to the inhabited part of the Howden district by gravitation. The idea of collecting a supply by means of adits driven into the hillside was considered, but abandoned on the ground that the outlay on purely experimental work would have been at least £4,000 or £5,000, and that it was, indeed, impossible to estimate the actual expenditure necessary to secure the full quantity required (167,000 gallons per day).

The county council had established a weir-gauge on the Drewton Beck in the year 1902, and readings of the daily flow of the stream were available from that date up to August, 1907, when the gauge had been abandoned. These readings showed that the flow was very variable (as was to be expected in the case of a stream with an "overflow spring" as the source), and that the minimum flow approached dangerously near to the quantity required for the supply of the district. At this stage the author, in making calculations as to the diameter of the mains which

* Paper read at the Summer Meeting of the Institution of Water Engineers on Friday last.

would be necessary under various heads, found that, owing to the great distance between the source of supply and the various villages to be supplied, the raising of the water to an extra height of 100 ft.—viz., 275 ft. above ordnance datum—would so reduce the cost of the mains as to more than cover the cost of pumping the water.

As this alternative opened out a much larger area in which a suitable source could be sought for, and admitted the possibility of obtaining the water from underground by means of a well or boring, the author carefully examined the area north and south of the Drewton and Weedley springs with such an alternative in his mind. In this way he was led to devote his attention to the neighbourhood of Newbald, situated about 2 miles north of these springs.

The village of Newbald, except that it is outside the Howden rural district, is situated topographically in a position very similar to that in which the Drewton and Weedley springs appear at the surface, that is to say, at the mouth of a deeply indented valley cut into the chalk wolds, and radiating into several smaller branch valleys. These valleys are all conspicuous for the absence of visible streams, although all have been obviously formed by flowing water. At a point east of the village, where the denudation of the chalk has thrown the outcrop of the underlying clay about ¼ mile east of the normal line, are powerful springs draining the chalk, which form a stream known as Newbald Beck. This stream, after passing west and south-west through the village, turns south for about 1 mile, then south-west through another village (within the Howden district), and thence southwards until it joins the Drewton Beck referred to above.

About 200 yds. below the point where the stream turns to the south . . . it is joined by a small tributary which rises at a spring situated in another valley, similar to the main valley, but which curves sharply to the south-east about ¼ mile east of the church. This valley is very deeply cut into the chalk wolds, and extends for a distance of 1 mile from the point where it bends to the south-east. It is entirely free from dwelling-houses, and calculations from rainfall records showed that the drainage of this valley should provide an ample supply for the Howden district. The stream formed by the spring at the mouth of this valley also showed an ample discharge when first measured, and the author felt every confidence in making a trial boring on the centre-line of this valley at such a distance from the spring as to preclude any risk of claims from riparian owners. This boring, however, beyond, showing the saturation level in the chalk, the thickness of the chalk, and the existence of a well-defined band of "red chalk" at its base, proved a complete failure as regards yield of water.

The next step taken was to sink a well to the base of the chalk at a point ½ mile further down the valley, and from this headings were driven across the centre-line of the valley with a view to intercepting the underground stream which was assumed to be draining the valley towards the spring. A supply amounting to about 4,000 gallons per hour was obtained by this means, but as this was inadequate and likely to decrease after continuous pumping, it was necessary to consider whether a sufficient supply could be obtained from any one point on the chalk outcrop.

The failure of this well, sunk on the centre-line of a deeply cut chalk valley, proved beyond possibility of doubt that, contrary to generally accepted theory, and experience in other chalk areas, the underground drainage or stream lines did not in this case follow the surface configuration. Calculations based upon the minimum rainfall of the district showed that, had this been the case, an ample supply would have been obtained at this site. Before abandoning it, however, the author had a boring driven from the bottom of the well to ascertain the sequence of strata underlying the chalk. The data so obtained proved very interesting and useful, but unfortunately the yield of water was not materially increased, and for financial reasons the author could not advise the council to continue the experimental work at this site, either in proving the direction of flow of the underground chalk-water, or in seeking another source of supply below the chalk. It was afterwards proved that if this boring had been continued for a further 10 ft. it would have reached the oolitic limestone, and possibly tapped a sufficient supply of water therein, but no evidence of this was available at the moment, and the results since obtained elsewhere have entirely justified the decision arrived at.

In the course of his investigations on the banks of the Newbald Beck, the author had observed some very strong springs flowing into it at a point situated about half-way along the stretch which travelled southwards. These proved on examination to have been piped with earthenware drains (in the form of an inverted U laid on flat tiles), extending for a distance of 140 yds. across a field to a point just below and on the west of the road leading southwards from the village. Excavations at this point revealed three springs at a depth of about 3 ft. below the surface, and a trial boring immediately to the east of the springs revealed further that the water rose through vertical fissures from a depth of 12 ft. below the surface where the oolitic limestone was touched.

The ordnance geological map showed that this limestone outcropped only on the west of the beck, and personal observation proved that the limestone on the west of the beck drained directly into the stream, so that the water flowing in these springs could not possibly be the natural drainage of the limestone. The problem as to the real source of this large flow (rough measurements showed it to amount to about 400,000 gallons per day from the three springs, or nearly one-half of the flow of the beck at this date) became therefore extremely interesting. A further study of the geological maps, sections and memoirs revealed the fact that the beds between the chalk and the limestone were arched on a north to south plane, and that at a point about 1 mile north of the village (marked on the map as "Newbald Sike"), the clays separating the chalk from the limestone disappeared (see Diagram A). At this point a characteristic chalk valley extends eastwards into the wolds, very similar to those at Drewton and Newbald, but distinguished by an entire absence of any springs or stream, and it then became evident that at the base of this valley erosion had removed the clay and impervious band of "red chalk" separating the two water-bearing strata, and thus enabled the natural drainage of the local chalk area to pass into the freely fissured limestone, and, following the dip, to pass southwards until, at a point where the erosion caused by the Newbald Beck or its earlier prototype had rendered the overlying beds (consisting chiefly of chalk, gravel and glacial drift) insufficient to resist the upward pressure due to the head, the water had burst open an outlet for itself, whence it flowed into the beck, as above described.

A small trial boring was then driven at a point 200 yds. to the east of the oolite springs, above described, and the strata proving approximately what was expected, and the water level closely corresponding with that of the water at the springs, a contract was entered into for a 12-in. boring to be driven into the oolitic limestone, and for test pumping therefrom. This boring was carried out on a site adjacent to the small trial boring, but below the outcrop of the Oxford clay, and where the conditions were otherwise more favourable for the construction of permanent works, and was so successful that three weeks' continuous pumping at a rate of 10,000 gallons per hour made no impression whatever on the water level.

On analysing the water, however, signs of pollution were found, and a period of three months was occupied in tracing and removing the cause of this pollution and in again testing the 12-in. boring. The final test proved perfectly satisfactory, and the scheme will be proceeded with as soon as the war is over and financial conditions become more nearly normal.

The work involved in detecting and preventing the pollution of the limestone-water has no particular geological interest except in so far as it revealed the existence of a communication between the "Kellaways Rock" (mainly represented by a fine compact bed of grey sand about 22 ft. thick, yielding a supply of locally polluted water) and the oolitic limestone. This communication had no doubt been established by three local wells sunk in the "Kellaways Rock," where borings had been driven into the limestone without sealing the bottoms of the wells. In each case a concrete bottom was inserted at the bottom of the well, ater which the water in the well rose to a higher level, being that at which the "Kellaways" water had been found in the council's 12-in. boring. This water being thus shut off from the limestone, the water from the limestone proved to be as satisfactory in regard to quality as it was in regard to quantity.

It may be here mentioned, as a matter of more general interest, that the water in the "Kellaways Rock" finds an outlet at various points in and near the village. There are therefore three separate water supplies in this area, which, except that all are derived from the chalk in the first instance,

are entirely distinct one from the other until they meet in the Newbald Beck -viz., (1) the direct overflow from the local chalk springs; (2) chalk-water flowing through the local "Kellaways" beds; and (3) the chalk-water which enters the oolitic limestone to the north of the village and discharges at the springs, to which reference has been made above.

Other features of the works, including analyses of the water, will be given, if opportunity offers, when the works have been carried out, but the author has preferred to limit the present paper to the experimental works and the hydro-geological data obtained therefrom.

FIRE TESTS WITH FIRE EXTINGUISHERS.

[We have received from the Pyrene Company, Limited, the following comment on the report of the British Fire Prevention Committee's recent tests, and we give it verbatim in accordance with our usual audi alteram partem principle. The précis we published did, in fact, differ materially from the actual report itself, and we regret that our attention was not drawn to this when we received the précis.]

Dear Sir,—Referring to notice appearing in your issue of June 11th in regard to tests conducted by the British Fire Prevention Committee of the Pyrene fire extinguisher, we take exception to the second paragraph, in which you state:—

> "The testers notified the committee that their appliance was not suitable for the ordinary fire tests with loose, inflammable materials, as required under the committee's standard for ordinary extinguishers."

We never made any such statement to the British Fire Prevention Committee.

The third and fourth paragraphs of your notice, which state:—

> "The tests that were undertaken were the easier part of the committee's series of petrol tests, &c.," are true in part, but very misleading, as no mention is made of the fact that, at our suggestion, a large number of very practical and difficult supplementary tests were accepted by the committee and undertaken by us.

In paragraph five you state:—

> "In other words, this appliance is primarily useful for small spirit fires, as met with in motor-car work, &c., but is in no way applicable to ordinary fires."

This statement is untrue, in that we claim—and it has been proven by a large number of cases in private houses, as well as factories, stores, &c.—that Pyrene *is* effective on ordinary fires, if used while such fires are in an incipient state.

Such an instance as is shown by the attached testimonial, which has just come to hand, is typical of the real value of Pyrene on an ordinary fire, such as would be apt to occur in a private residence. Such firms as Vickers, Limited, have had a considerable number of experiences with Pyrene, as a result of which our machines are extensively installed throughout their various works.

The British War Office and Admiralty have purchased over 30,000 extinguishers in the last eighteen months, our sales to them having increased practically each month over preceding months. We have orders from these two Government Departments during the present month for over 10,000 extinguishers. We believe that the Government would hardly purchase in such large quantities if Pyrene had not amply justified the faith they have put in it, and we have a very large number of instances on record where fires have occurred on Government property and been successfully extinguished with Pyrene. These include motor car, petrol, and general stores, ammunition trains, as well as ordinary fires in buildings. Such instances as these are better proof of its efficacy on ordinary fires than any number of tests under artificial conditions.

The last point we take exception to is the statement in regard to hydrochloric acid. No comment regarding this is made in any way whatsoever in the British Fire Prevention Committee's report.

You may be interested to know that all submarines in the British Navy are fully equipped with Pyrene, and from this it is quite evident that the authorities at the Admiralty are convinced that its use is not dangerous to the crews.

Pyrene extinguishers are known and approved by underwriters' laboratories in the United States, and our appliance is awarded equal recognition with soda and acid extinguishers on practically all ordinary risks, and we are given preference on special risks, such as paint and chemical factories, petrol stores, &c.

An interesting fact is that English insurance companies operating in America of course recognise Pyrene on all such risks in that country.—Yours faithfully,

Pyrene Company, Limited.

19-21 Great Queen-street,
London, E.C.
June 22, 1915.

[copy of testimonial referred to.]

I have much pleasure in testifying to the wonderful effects of the Pyrene fire extinguisher, which was undoubtedly the means of saving my house from being burnt down.

Last Sunday, June 13th, our middle-floor back room was ignited by the fire of a match, and the room was soon in flames, and although several buckets of water were used, they only seemed to aggravate the condition, as the heat had melted the gas pipe, and a strong jet of gas escaping from this pipe had ignited, and all the furniture in that part of the room, including a piano, sewing machine, pile of music, chair and table was well alight.

Luckily, we thought of the Pyrene extinguisher, which had been sent on approval from Whiteley's the day before; but by this time the heat and smoke were so intense that I could not enter the room to use the extinguisher, but had to stand in the doorway and squirt the liquid from there.

Despite the fact that I had never handled the extinguisher before, it was only a question of a few moments' squirting and the fire was instantly arrested and put out as if by magic. All those who were present and saw the wonderful effect were astounded.

The apparatus being so simple to work, no time is wasted, and the quantity of fluid required to extinguish flames is so little that it makes a most economical instrument to use. I shall certainly recommend it to all I know.

(Signed) O—— W —— R——.

June 20, 1915.

SOME RECENT PUBLICATIONS.*

Guide to the Reports of the Royal Commission on Sewage Disposal. By G. Bertram Kershaw, M.Inst.C.E., M.Am.Soc.C.E., F.R.San.I., F.G.S. Price 5s. nett. London: P. S. King & Son, Limited.

Engineers, surveyors, medical officers of health, chemists and bacteriologists frequently have occasion to refer to the voluminous reports and appendices presented by the Royal Commission on Sewage Disposal, and in most cases there is difficulty in finding quickly the volume and the page on which the information required is printed. As the total number of documents amounts to some thirty volumes, it is obvious that a guide to their contents is indispensable, and this is now available in the present volume. All the headings and sub-headings have been extracted, and set out seriatim for each report, so that the subject matter is thus given in a condensed form with the pages of the document on which each item appears. With the aid of the separate indices of subject matter, names and places, it should be possible for anyone to find any information at a moment's notice, and no bookshelf containing the Royal Commission's reports can be considered complete without a copy of Mr. Kershaw's valuable guide.

Timber Fireproofing.—The directors of the London and North-Western Railway have decided, after full investigation and exhaustive trial, to instal a plant at their Wolverton works for the purpose of rendering wood fireproof by the "Oxylene" process. The wood so fireproofed is to be used in the construction of their railway carriages, wagons, &c., and the plant to be installed will be capable of dealing with 150,000 cub. ft. of wood per annum. The "Oxylene" process has been adopted for general building construction by Messrs. Cadbury Bros., Limited, Wm. Cooper & Nephews, and other well-known firms.

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

Institution of Municipal and County Engineers.

ANNUAL GENERAL MEETING IN LONDON.

The forty-second annual general meeting of the Institution of Municipal and County Engineers opened yesterday morning at the Institution of Civil Engineers, Great George-street, Westminster, and Mr. H. T. Wakelam, M.INST.C.E., F.G.S., the county engineer of Middlesex, was formally installed as president in succession to Mr. J. S. Pickering, M.INST.C.E., the borough surveyor and water engineer of Coventry. Meetings of the council and the subscribers to the Orphan Fund were, as usual, held before the commencement of the proceedings. Following the preliminary business, which included the consideration of the annual report, the presentation of premiums and the delivery of the presidential address, there was an informal discussion on town planning, at which Mr. Raymond Unwin, town planning assistant to the Local Government Board, was present, after which the members adjourned for luncheon. The discussion of papers commenced in the afternoon, and will be continued to-day. Lack of space prevents our giving more than a severely-condensed account of yesterday morning's proceedings, our intention being to print a full report in next week's issue, in which also will appear a first instalment of the debates on the various papers.

When Mr. Wakelam rose to deliver his address yesterday there were present Sir James Lemon (Southampton), Messrs. G. Alves (Glastonbury), W. P. Anderson (Winchester), W. Ashbee (Middlesex), B. Ball (Singapore), J. Patten Barber (Islington), W. E. Beacham (Leek), J. Berry (Kingstown), C. P. Billing (Bristol), J. Birch (East Ham), W. J. Bird (Midsomer Norton), W. N. Blair (St. Pancras), W. T. Body (Birmingham), H. Percy Boulnois (Westminster), J. Bowen (Reading), T. Bowes (Hereford), C. H. Bradshaw (Middlesex), J. A. Bridge (Birmingham), A. T. Bridgewater (East Ham), C. Brown (Edmonton), R. Brown (Southall-Norwood), C. Brownridge (Birkenhead), J. Bryson (Midcalder), F. L. Burch (Dorchester), W. Burn (Sutton-in-Ashfield), A. Burton (Stoke-on-Trent), T. Caink (Worcester), W. L. Carr (Ruislip-Northwood), G. F. Carter (Croydon), S. H. Chambers (Hampton), H. T. Chapman (Kent), T. Charles (Harrow), R. Chart (Coulsdon and Purley), H. A. Clarke (Briton Ferry), W. A. T. Clarry (Sutton Coldfield), C. A. Clews (Derby), R. H. Clucas (Kingston-on-Thames), J. W. Cockrill (Great Yarmouth), T. Cole (Westminster), T. P. Collinge (Rotherham), A. E. Collins (Norwich), H. Collins (Colchester), R. Collins (Enfield), J. S. Crawshaw (Weybridge), R. Craig (Bromley Rural District Council), J. W. Croxford (Brentford), R. H. Crummack (Dover), E. H. Crump (Hinckley), G. Davies (Widnes), S. H. Davies (Wirral), N. F. Dennis (West Hartlepool), J. Diggle (Hyde), P. Dodd (Wandsworth), S. Douglas (Kenilworth), S. R. Drake (Leatherhead), W. J. Dresden (Battersea), J. W. Drew (Wath-upon-Dearne), J. Eastwood (Sowerby Bridge), J. Edey (St. Neots), W. H. Eley (Newmarket), E. J. Elford (Southend-on-Sea), J. England (Wrexham), J. Price Evans (Wrexham), T. W. Evans (Smethwick), W. A. Farnham (Sidcup), H. C. Fread (Esher and the Dittons), A. R. Finch (Kensington), W. Fowlds (Keighley), T. P. Frank (Stockton-on-Tees), S. S. Gettings (Tring), W. J. Goodwin (Salisbury), A. D. Greatorex (West Bromwich), G. Green (Wolverhampton), W. H. Grieves (Sutton, Surrey), H. J. Gullan (Belfast), G. Haigh (Southall), H. Hardy (Barrow-in-Furness), W. Harpur (Cardiff), J. Harris (Tonbridge Rural District Council), J. C. Harris (Norwich), E. Y. Harrison (Guildford), P. T. Harrison (Chelmsford), T. Henry (East Retford), H. Holmes (Ossett), R. Holt (Leeds), A. Hosken (Smethwick), H. Inglis (Rutherglen), A. C. James (Grays), J. Jeffery (Dunmow), R. H. Jeffes (Maldens and Coombe), J. Johnson (Rawtenstall), W. M. Jones (Chester), W. H. Jukes (Tipton), J. Julian (Cambridge), C. C. Keep (Westminster), J. D. Kennedy (Retford), P. G. Killick (Finsbury), F. O. Kirby (Doncaster), G. W. Lacey (Oswestry), W. T. Lancashire (Leeds), A. J. Lander (Middlesex), H. W. Longdin (Penge), W. F. Loveday (Stoke Newington), R. A. Macbrair (Lincoln), J. McCallum (Uxbridge Rural District Council), D. McInnes (Edinburgh), L. S. McKenzie (Bristol), J. Marshall (Malling), H. J. Marten (London), F. Massie (Wakefield), E. R. Matthews (University of London), H. Miller (Ipswich), R. Moir (Edinburgh), J. Moncur (Stafford), J. H. Montgomery (Llanelly), T. Moulding (Exeter), A. E. Nichols (Folkestone), P. H. Palmer (Hastings), J. H. Parkes, (Sutton Coldfield), F. Parr (Bridgwater), J. Paton (Plymouth), F. W. Pearce (Twickenham), T. S. Picton (Eccles), F. R. Phipps (Basingstoke), W. Plant (Stafford), S. S. Platt (Rochdale), A. J. Price (Lytham), W. B. Purser (Kesteven), J. C. Radford (Putney), W. Ransome (Worcester), F. Read (Gellygaer), J. M. Reed (Middlesex), W. Regester (Middlesex), E. J. Reynolds (Friern Barnet), H. L. Richardson (Worcester), W. Riley (Willesden), W. A. Riley (Birmingham), C. C. Rivers (Harogate), F. Roberts (Worthing), J. W. Dudley Robinson (Westminster, secretary), O. Claude Robson (Willesden), L. Roseveare (South Shields), A. J. Rousell (Whitley Bay), E. Y. Saunders (Barnstaple), J. S. Sawdon (St. Annes), J. A. Settle (Bury), J. E. Sharpe (Cheshunt), H. Shaw (Ilford), J. Siddalls (Tiverton), J. S. Sinclair (Widnes), F. W. Smart (Bedford), J. F. Smillie (Tynemouth), P. Smith (Bury), A. Spence (Dundee), J. P. Spencer (Tynemouth), F. W. Spurr (York), E. Stead (Somerset), A. Stevenson (Ayr), J. Stewart (Glasgow), H. E. Stilgoe (Birmingham), J. Storrar (Midlothian), W. Stubbs (Blackburn), J. Sutcliffe (Deptford), S. Sutcliffe (Mytholmroyd), D. Sutherland (Southgate), A. S. P. Taylor (Bedwas), A. C. Thomson (Midcalder), J. Thomson (Dundee), J. Taylor (Walsall), R. J. Thomas (Bucks), T. Tidswell (Sowerby Bridge), H. Tillstone (Brighton), M. Turnbull (Shildon), C. H. Walker (Loughborough), T. Walker (Ystradgynlais Rural District Council), J. W. Walshaw (Peterborough), J. R. Walters (Congleton), J. P. Wakeford (Wakefield), J. Watson (Strathaven), J. A. Webb (Hendon Rural District Council), J. S. Weir (Jarrow), H. G. Whyatt (Grimsby), R. Wilds (Walton-on-Thames), F. Wilkinson (Prestatyn), H. F. Wilkinson (Tottenham), J. Williams (Hampstead), E. Willis (Chiswick), O. E. Winter (Hampstead), R. H. Winterbottom (Irlam), and E. Worrall (Stretford).

Alderman W. REGESTER, J.P., chairman of the Middlesex County Council, in extending a welcome to the members, said these gentlemen, who were well-known members of their profession, had met to discuss quietly and calmly such important questions as town planning, the disposal of sewage, and traction—all of which he trusted would be brought into use for the advantage of the people of the country when the present crisis was overpast. It was a great pleasure to him, as chairman of the Middlesex County Council, to meet the members of the institution, and he must ask them, assembled as they were in a little Middlesex corner of London, to imagine themselves just across the road in the magnificent county hall erected jointly by Mr. Gibson and Mr. Wakelam, their new president. They had, Mr. Regester added, conferred an honour upon the county of Middlesex in electing the chief engineer of the county as their president for the coming year.

The PRESIDENT (Mr. J. S. Pickering) briefly returned thanks for the warm welcome they had received, and said it was generally recognised that their institution conferred a great benefit upon the community at large.

The minutes of the last general meeting were read by the secretary, Mr. J. W. DUDLEY ROBINSON, and duly confirmed.

The meeting then proceeded to consider the annual report of the council.

ANNUAL REPORT.

The report stated that during the financial year ended April 30th last 102 members, consisting of 43 members, 26 associate-members, and 33 students, were elected, while 13 members, 7 associate-members and 1 student resigned. The roll now stood at 1,769.

Members of the institution on active service numbered 134, and a list of these was given in the report.

Regret was expressed by the council that the outbreak of war had, for the time being, diverted the attention of the Local Government Board and local authorities from the important matter of superannuation.

FINANCES.

The financial position of the institution was reported to be in a very satisfactory condition. The only items showing an increase of any importance were salaries, due to the arrangements made on the appointment of Mr. Cole as consultant secretary, and amount

written off under investments; the latter item was due solely to the depreciation in trustee securities since the outbreak of war.

The receipts from subscriptions showed an increase, but other sources of income small decreases. A reduction in the amounts received on account of entrance fees, examination fees, and interest was to be attributed to the outbreak of war.

Turning to the balance-sheet, it was very satisfactory to see an increase of £374 2s. 4d. in the accumulated fund, indicating a substantial increase in the reserves, and, consequently, the stability of the institution. The arrears of subscriptions showed an increase, and the council appeal to members for the prompt payment of their subscriptions, even in the present hard times, as it is essential to progress towards the various objects of the institution.

The President moved the adoption of the report.

Mr. E. Willis (Chiswick) seconded, and suggested that in future the annual reports should contain some reference to the Orphan Fund. This was specially needed, as he found that only 12 per cent of the members were annual subscribers to the fund.

Mr. T. Henry (East Retford) said he would go further than Mr. Willis, and make it compulsory for every member to subscribe at least 5s. a year to the Orphan Fund. He suggested that they should alter the Articles of Association so as to bring upon the council urban and rural surveyors as well as surveyors of corporations. He congratulated the members upon the reduction of the printing account, and expressed a hope that it would be still further reduced in future.

Mr. H. Gilbert Whyatt (Grimsby) called attention to the omission of a report of the East Midland District from the annual report, and hoped it would be possible to have it inserted.

Mr. W. H. Grieves (Sutton) referred to the circular issued by the chairman of the North-Western District, and asked whether such a letter did not constitute canvassing in opposition to the by-laws of the institution.

Mr. M. Jones (Chester) considered that the issue of the circular referred to was canvassing under by-law 14, and, if so, he asked whether the election of the members concerned was valid.

Mr. Reginald Brown (Southall) deprecated continual attempts to alter the Articles of Association, and thought it was best to let the matter of the circular drop.

Mr. E. J. Elford (Southend-on-Sea) would hesitate to say that the circular constituted canvassing, but at the same time he thought the council were justified in dealing with it as they had.

Mr. A. J. Price (Lytham) did not think such a circular would be issued again. At the same time, the fact that all the gentlemen named in it were selected showed that they were men who really had the confidence of the institution generally. (Cries of "Oh!")

The President said that the secretary would bear in mind the suggestion with reference to drawing attention to the Orphan Fund in the annual report. He thought the circular to which several members had alluded might be allowed to drop. Its issue was certainly against the wishes of the council, and if it was not contrary to the letter of the by-laws it was contrary to their spirit.

At this point a portrait of the late Mr. Charles Jones, of Ealing, was unveiled amid applause, and the President, in the course of a eulogy of the character of Mr. Jones, said it was intended to hang the picture upon the walls of the institution's offices.

The premiums for papers having been presented, the meeting proceeded to the election of auditors and scrutineers, vacancies being filled by the appointment of Messrs. W. H. Grieves and R. Brown.

Mr. Pickering then installed Mr. H. T. Wakelam as president of the institution for the ensuing year, and invested him with the chain of office. Mr. Wakelam took the chair amid hearty applause. A vote of thanks to the retiring president was proposed by Sir J. Lemon, seconded by Mr. E. G. Mawbey, and carried with acclamation. Mr. Wakelam then rose and proceeded to read the following

PRESIDENTIAL ADDRESS.

In addressing you as your president, I acknowledge, with sincere appreciation, your kindness in electing me to the chair of the institution for the year 1915-16.

Being singled out to occupy the presidential chair is a great compliment, and means much in the way of satisfaction and encouragement to those upon whom the distinction is conferred.

To me the acceptance of the honour was somewhat difficult, because one felt that the task of fulfilling the position of president to one's own satisfaction had been made extremely onerous by the strenuous efforts of those who had preceded me, and by the conspicuous ability they displayed during their terms of office. One cannot by any means hope to excel, but if the spirit of emulation which has been inculcated in one's mind through a long association with past-presidents at council meetings will prove a momentum to success, I can lay claim to a desire to do all I can in the interests of the institution during my tenure of the presidential chair.

The term "engineering," as you all know, covers not only the construction of engines and machines, but embraces also the comprehensive field of docks, harbours, reclamation embankments, railways, canals, waterworks, sewage works, rivers works, bridges and roads; and also hydraulic, mining, electrical, motor and marine engineering.

The work of the engineer covers, therefore, an extremely wide field, the constant extension of which renders almost every department of physical science a necessary and fundamental part of a course of education, founded upon a proper basis of mathematics, for those entering the profession.

To a theoretical preparation there must, before a man can be said to be thoroughly equipped for his work, be added a sound practical training in the particular branch of the profession he chooses to follow, or wherein to specialise. It is a "long, long way" to final success, but in this way only can an engineer hope to succeed in his work. Such a training will enable him to bring to bear that thought, concentration and economical adaptation so necessary for that inventiveness and accommodation to circumstances which many members of this institution have so skilfully displayed in the past, and which have been the means of helping them to the high positions they hold in the profession, which positions they have so hardly won by efficient work and constant application. The measure of a man's theoretical knowledge is proved by his success before a board of examiners, but practical experience can only be obtained in the workshop and on works of construction, where a man will, if at all of an observant nature, quickly see how and where his theoretical ideas require modifications to meet actual constructional conditions. While I think it is absolutely necessary for a sound theoretical training to be afforded to beginners in the profession, I must confess that I have a sneaking liking for the man who possesses ideas prompted by practical work.

If I may be allowed to address a few words to the younger brethren, I would say, select as models two or three of the more successful practitioners of the institution and follow their examples. By so doing success will probably ensue. "Rome was not built in a day"; neither will the higher positions in the municipal and county engineering world be won in a day's work. Such positions are, however, always open to those who care to take the trouble—as our American friends would say—"to get there."

I would also impress upon the younger members the necessity for visiting works during the preparation of materials and during the actual constructional operations. The measure of a man's knowledge cannot always be judged from the length of his experience. For instance, two men may go through exactly the same job, and at the end one of the two may show a much greater knowledge of both its principles and details than the other. This arises from the degree of observation exercised by both men. Where one fails in this, another succeeds. Much can therefore be gained by observation, and the more visits that are made to works in progress the more knowledge will be gained by the observant student. In this connection it would, I think, be well for the junior members in each of the districts of the institution to band themselves together and arrange visits to works in progress on the lines of the visits made by students of the Institution of Civil Engineers.

While offering a word of encouragement to those juniors who have already started their professional careers, it would not perhaps be out of place (especially so as there are laymen present) if I also tendered a few remarks on the advantages of the engineering profession. With the world power of England—such as is held by no other nation—its vast possessions, its interests and influences, there is an almost unlimited field for a display of energy by men who possess constructive ability and capacity. In comparison with other professions, engineering offers many opportunities for men to gain, not only a good

[illegible] to the profession of engineering in which [illegible] are engaged [illegible].

[illegible] have been described as engaged in the work, [illegible] have possessed [illegible] and energy for hard work. In addition to [illegible] a constitution sufficient to withstand all kinds of weather and physical and mental strain form necessary attri[illegible].

With regard to the scholastic work of a boy desirous [illegible] will be [illegible] matics, mechanics, physics, chemistry and geometrical drawing. A boy [illegible] already referred to.

Should it be within the power of the parents to [illegible] school provided with laboratories and workshops, it would add greatly to his advantage. He would in this way combine theoretical study with practice of the kind he would obtain in an engineering works. This knowledge should fit the boy for the work he [illegible] and would prove to be a good [illegible] and would [illegible] apprenticeship [illegible] difficulty to those [illegible].

On the other hand, young men who have received [illegible] things which they cannot have learnt during their college course, and that it will take years of practical experience to complete their engineering education.

An artistic draughtsman who lacks that constructional knowledge which will enable him to prepare a sound specification explanatory of his work will not be able to keep pace in the world's competition with the man who can prepare a fairly good drawing with a specification fully explanatory of the practical work he desires should be carried out.

The work of the engineer is fast becoming more and more technical and important, and with the march of time and competition it appears to me that the best-trained men will have the greater chance of success, not only in the particular branch practised by members of this institution, but also in all other branches.

Going briefly into the history of engineering, we find that one of the first works of magnitude was carried out by those of whom we speak as "the ancients." It was no less a work than the construction of the canal uniting the Red Sea with the Nile. That canal [illegible] begun by Leostris. Others say that the work was carried out by Necos, and finished by Darius I., 525 B.C. To whomsoever the work may be properly assigned, its existence shows that engineers were actively at work many centuries ago.

As one of the first engineering works of which we have an authentic record was in connection with the Nile, it may not be misplaced if I recall the fact that within recent years a stupendous engineering feat, known as the Nile dam, was carried out across the same river, with which work a present eminent member of this institution was conspicuously connected.

Previously to the eighteenth century there were many celebrated undertakings carried out by engineers, among them being the dome of St. Mary's, Florence, by Brunelleschi, and the dome of St. Peter's, Rome, by Michael Angelo. Other great engineers who practised centuries ago were San Michalin, the supposed inventor of the military bastion system, and Pagan and Vauban, who were both celebrated in their different branches of work.

During the eighteenth and nineteenth centuries, and also in our own time, there have been many successful engineering achievements of considerable magnitude connected with which, during the more later period, both past and present members of this institution were engaged. In regard to some of the achievements for which members have been responsible one may refer to large extensions of the main drainage works of the Metropolis, the main drainage works of Frankfort-on-the-Main, the supply of water from Wales to Liverpool, the supply of water from Wales to Birmingham, and the additional supplies of water to London. The Manchester Ship Canal, the Forth Bridge, the Tay Bridge, the Tower Bridge, the Simplon Tunnel, the Severn Tunnel, the Mersey tunnels and the Thames tunnels, and many other works, comprising vast undertakings and expenditures, have also been carried out within comparatively recent times.

The Victorian era saw many of the large trunk railways and canals of this country brought into operation, while it appears but yesterday that the Great Central Railway and several of the large metropolitan tube railways were completed and opened to traffic. The original construction of railways in this country gave a great impetus to the work of the engineer. Some of the undertakings which made such men as Stephenson, Telford, Brunel and others famous are the bridge over the Tyne, the bridge across the Menai Straits, and the tubular bridge at Saltash, which monuments appeal to us to-day.

Those members who are acquainted with the works I have enumerated may with pride arrogate to themselves the satisfaction of being connected with a profession which has produced men of the capacity of those who carried out the works to which I have referred.

The particular branch of engineering in which most of us are engaged does not offer or afford many opportunities for an exhibition of that skill which is required for undertakings such as some of those I have mentioned. Opportunities have, however, arisen in connection with many engineering schemes, and with sewage and water works in particular, for proving the grit of many of the present members of this institution. The successful results of their labours cannot be otherwise than most gratifying to us all.

With the cheap facilities for travel and mental equipment now obtainable, I am constrained to think that members of our body will carry on and will worthily uphold the traditions of the past, and that the succeeding years will bring to the presidential chair men who in every way are well versed in their profession, and well equipped for the position.

Since the passing of the Public Health Act, 1875, a sum greatly exceeding £100,000,000 (roughly estimated from returns) has been expended in connection with the disposal of sewage and water supplies in England and Wales alone.

That the expenditures have been justified and warranted is amply proved by a glance at the public health statistics which have been compiled since the date of the passing of that Act. The returns show a very large decrease in the annual death-rate since that time. The diminution in this connection is in itself a sufficient justification for the expenditures, apart from the comforts and cleanliness experienced, and apart also from the amelioration of the poorer classes from the dirty and filthy surroundings which obtained in many parts of our large cities and towns previously to the passing of the Act of 1875.

This institution was first started in the year 1873, and it may, I think, lay claim to being the pioneer of the movement which has proved so eminently successful in the interests of public health, and to the lion's share of credit for the improvement and life-saving efforts made so manifest in the statistical returns I have already referred to. Long may such efforts continue!

The question of local improvements for the well-being of the working classes is, to my mind, a very important subject, and housing schemes for their welfare should be fostered, advanced and supported on every occasion by the members of the institution. The Housing Acts are important measures, and by constantly advocating the adoption of their provisions the members of this institution will still further add to the advancement and health-giving surroundings of the community. Environment in daily life has great influences for good or evil. The brighter the surroundings the greater the incentive to moral improvement and self-respect of mankind, and therefore, as I have said, to foster brighter surroundings is a move in the direction of obtaining something for the poorer classes, especially, which will educate them towards self-respect and cleaner habits, which object alone is worthy of our best endeavours.

In connection with the Housing (No. 2) Act, passed during the last Parliamentary Session, the National Housing and Town Planning Council have published a memorandum of value, giving, among other things, details of, and the clauses relating to, loans to be granted. I commend the memorandum to those

members who at present have housing schemes in hand. I would also commend to the notice of those members of the institution from rural areas who are dealing with the housing problem the model plans for cottages which have received the approval of the Board of Agriculture and Fisheries, and of which copies can now be obtained direct from Messrs. Wyman & Sons, Fetter-lane, or through any bookseller. With regard to the proposals of the kind for rural districts, the late President of the Local Government Board offered a short time ago some interesting remarks. It has been said that cottages in rural areas could not be built and let to give any return of interest at anything below a rental of 5s. per week. Mr. Samuel's view is that if the agricultural labourer cannot afford to pay a rental of 5s., there are others, in almost every village, such as policemen, postmen, railwaymen, carpenters, blacksmiths, and men of other occupations, who could afford such a rental, and by building new cottages which such people may occupy it would free the cheaper buildings in which they now reside for occupation by their poorer neighbours. Mr. Samuel's suggestion should receive the most careful consideration, and should his proposal find favour at the hands of local authorities, those members of this institution who are connected therewith will, I feel certain, do their utmost to devise workable schemes and assist in so good a cause.

During the last fifteen or sixteen years great changes have manifested themselves in the methods employed in connection with road maintenance and construction. The changes have been brought about by the enforced requirements to sustain the traffic of the large numerical increase in mechanically propelled vehicles now using the roads of the country.

It seems but yesterday since the first trial run of motor cars to Brighton took place. I well remember the start of some thirty-three cars at 10 o'clock in the morning from the Hotel Metropole, Northumberland-avenue, in November, 1896, when many of the onlookers made fun of the (to them) snorting monsters, which emitted stinks of 20-horse power, and for which monsters many prophecies, to the effect that they were doomed to failure, were made. After a somewhat unexciting contest a few of the cars arrived at Brighton at a late hour the same day, while others arrived the next day, and others not at all. There were innumerable stoppages on the way, and much jeering from spectators along the route. How different to-day! Thanks to the motor engineer, cars have been so improved in the course of a few years that the Brighton journey can now be comfortably done in a little more than two hours.

At the same time the motor engineer, by introducing cars, was primarily the cause of the rapid deterioration which took place in connection with the carriageways of this country. As a set-off he has also primarily been the cause of the remarkable improvements to be seen on all sides in connection with the roads generally throughout the kingdom. When it was seen that the motor car had come to stay, steps from a road point of view had perforce to be taken to cope with its requirements, and members of this institution have been endeavouring, during the last ten or eleven years in particular, to produce carriageway surfaces suited to the requirements of motor traffic. The result of their labour has, I venture to say, been most satisfactory, as it is now admitted by experts on the subject from foreign countries that our roads, taken as a whole, are the best in the world. This despite the fact that during the last two years especially the endeavours of the road engineers of this country have been rendered infinitely more difficult by the extraordinary stress of the more modern vehicle and motor omnibus. In this connection the Government decided a short time ago to appoint two committees, one to consider the technical aspect of the question of damage to roads by such vehicles, and the other to consider the wider question as to the proper payment, if any, to be made by their owners towards the upkeep of the roads they use. Road authorities have no desire to throttle either commerce or trade, their only wish in this connection being that a settlement on a fair and equitable basis in the general interest shall be arrived at.

The subject heading of "The Improvement of Highways to Meet Modern Conditions of Traffic," on which papers will be before you to-day, is still one for much consideration and thought. Literally construed, the heading covers a comprehensive field in relation to road management, construction and upkeep as practised by us to-day.

It may truthfully be said that in this connection a new era in a somewhat specialised branch of engineering has set in. The innumerable brochures, papers and publications which have appeared on the road question during the last two or three years prove that there is still a large field open for inquiry and research.

There are factors which will always govern road construction and maintenance in this country; among them may be mentioned climatic, economic, and supply-and-demand conditions, which are all applicable, in varying degrees, to the different topographical and geographical areas of the kingdom. In discussing and considering the road question, these conditions, with other local circumstances, must be borne in mind. A comparison as to cost, method of repair, &c., of roads in the South of England, for instance, with roads in the North is no guide as to procedure, neither is it fair to compare systems of upkeep of roads in the Eastern Counties with those practised in the Western areas. Intercourse and discussions at our meetings on these and other subjects affecting our calling must necessarily help us in offering our final professional advice to our respective authorities. We are always much indebted to writers of papers for affording us opportunities for becoming more enlightened in any particular branch of our work, and especially so in regard to the work which has been made so difficult by the requirements of modern traffic. It has been said that "the man who stays at home never sees anything." The saying is perfectly true, and I am quite sure that it is of the greatest advantage to local authorities when their professional advisers are allowed and encouraged to attend meetings of this institution to discuss papers of the kind you will have before you to-day.

There is still room for thought and consideration in regard to—

- The planning of arterial and other roads.
- The classification of roads.
- The maintenance of roads.
- The improvement of existing highways and bridges.
- Bituminous methods as now practised.
- Tar-painting road surfaces.
- The use of mechanically-propelled vehicles *v.* horse-drawn vehicles for road purposes.
- Road signs.
- The restriction and control of heavy traffic, both as regards weight and speed.
- Experiments and tests of road materials.
- Local administration.
- Economic procedure.

As regards the question of "road classification," some of you will remember the suggestion I made in a paper submitted to this institution as far back as June, 1906, as to the necessity for a general scheme of the kind for the whole of the country. It is satisfactory to all of us, and to me in particular, that such a scheme is now being formulated by the Road Board, which scheme will, I hope, soon be definitely settled and working satisfactorily.

That paper contained also another suggestion to the effect that subsidies should be supplied from funds provided by the Government for the particular purpose of assisting county councils generally to make grants towards roads of different classes. A consummation of our hopes in this connection will, I trust, be realised directly a favourable opportunity arrives, and the Treasury finds itself in a position to make grants for the purpose.

In connection with "economic procedure," I think that if road engineers would look a little more into the question of "cost *v.* life" before deciding upon the kind of materials they propose recommending to their authorities, an elimination of "the chaff from the wheat," so to say, would quickly ensue. When it comes to be remembered that every single additional penny expended per square yard per annum on the maintenance of the roads of England and Wales, added to the roads bill, means an additional million of money to be annually found by the ratepayer, the point of "cost *v.* life" of road materials will be seen to be the most important monetary factor to be considered in connection with local government.

In the paper submitted by me to the institution in June, 1906, I mentioned the fact that there was then a great want of a material for road surfacing which would afford a life commensurate with its cost, and would come, in price, between creosoted wood paving and ordinary tar-painted water-bound metalling. This problem has not yet been fully solved. Although this be the case, there are now several materials on the market tending to this end, and I am constrained to

believe that, by the efforts of the members of this Institution jointly with those of the ready local element and the contractor, a full solution of the problem will be forthcoming.

You will agree when I say that a codification of the different Highways Acts now in operation should take place at the earliest moment. So much overlapping as at present exists in this connection is regrettable, and I do not think there is a single person present who would not welcome such a codification of the existing laws in relation to highway management and administration in this country.

We all welcome the request now being made by the County Councils Association to the Local Government Board for general regulations to be framed to deal effectually with—

The construction of road vehicles.
The number of passengers and weight to be carried.
The testing and licensing of drivers.
The mechanical fitness of the engines, gear, &c.
The routes to be followed.
Any other matters which will tend to secure proper conduct on the part of the drivers and conductors of vehicles plying for hire and for the safety of the public.

You will, I feel confident, join with me, and express an earnest desire to see issued at an early date improved regulations dealing with the points I have enumerated. Such regulations would assist authorities enormously in their endeavours to secure improved road surfaces. In connection with licences to drivers, it would prevent partly-blind persons being authorised, as at present, on payment of five shillings for a licence, to endanger the lives of many people. Under the present regulations there is nothing to prevent even a totally blind person being licensed to drive a motor vehicle, plying for hire or otherwise!

Next to the "road question" I think that of "town planning" has, during the last three or four years, been most in the limelight. Town planning is an engrossing subject, and the agitation in connection with it has probably done more for the education of the municipal engineer, in regard to the requirements and beautifying of towns, than any other project during the annals of the institution.

In mentioning the question of town planning, I would repeat the observations I made at the annual meeting at Cheltenham last year, in regard to arterial roads, which roads must be considered to form an indispensable part of town planning. As I said at that meeting, the lines of all proposed arterial roads should, to my mind, be laid down and finally settled before town planning schemes are decided upon. The latter could then be superimposed on the proposed arterial lines, so to say, and so form a complete whole instead of having some localities dealt with under the Town Planning Act and isolated from the main routes, which, undoubtedly, will be the case if town areas are laid out before the main arterial roads are settled.

The papers you will have before you for discussion have been written by prominent members of our body, and the discussions arising therefrom should prove of much value to the institution generally. I, personally, am much obliged to each of the writers for coming forward with a communication, especially at such a time as this, when probably every office in the kingdom has, to some extent, a depleted staff owing to the uncontrollable and deplorable circumstances of the war, in which so many nations are engaged.

Before closing I should like for a moment to refer to the Road Exhibition and Conference to be opened to-morrow at the Horticultural Hall under the auspices of the County Councils Association. Anything introduced by public bodies outside the institution who are connected with the welfare and upkeep of roads to the extent the County Councils Association is interested in the subject, should have the support of the members of the institution, and I commend the exhibition to your notice. None of you will, I am quite sure, lose anything by paying it a visit.

In concluding, let me say that the absence of so many members from the meeting to-day has, undoubtedly, been caused by the dreadful war that has been proceeding so long. To those absent members who are serving their country we send our best wishes for a safe and speedy return, and let us hope that when peace is declared it may be of a lasting nature! In this connection also let us sincerely hope that no more mad dogs will be let loose in Europe for very many centuries to deal with "scraps of paper."

Gentlemen, I will now thank you for listening to me so patiently, and for the kind way you have welcomed me as your president to-day. I am more than grateful for your mark of consideration, and can only again repeat that I hope to do all I can during my year of office for the benefit of the institution with which I am deeply concerned in regard to the interests it represents.

(To be continued.)

ORPHAN FUND MEETING.

The annual meeting of the subscribers to the Orphan Fund was held in the morning, the president, Mr. J. S. Pickering, in the chair.

Mr. O. CLAUDE ROBSON, hon. secretary and hon. treasurer, read the annual report, as follows:—

ANNUAL REPORT.

To the Subscribers to the Orphan Fund of the Institution of Municipal and County Engineers.

GENTLEMEN,—The committee entrusted with the management of the Orphan Fund instituted in 1900 beg to report but little variation in the income and expenditure during the year 1914 as compared to that of the preceding year. This may be considered fairly satisfactory, looking to the abnormal conditions prevailing during the last five months of the year, with many members away on service, and with the many demands made upon those remaining, owing to the dreadful war now devastating Europe.

The comparative results of revenue and expenditure for the two years may be summarised as follows:

	1913			1914		
Revenue	£	s.	d.	£	s.	d.
Balance from previous year	180	10	3	117	2	7
Donations	15	1	10	12	15	0
Subscriptions	139	18	6	135	12	6
Collections at meetings	28	14	3	43	17	9
Interest on investments	36	10	6	37	3	4
Total ...	£400	15	4	£344	11	2
Expenditure:						
Grants to orphans ...	170	0	0	160	0	0
Printing, stationery, postages, &c.	9	17	3	6	19	8
Purchase of London County 3½ stock ...	100	0	0	100	0	0
Transfer of stocks to new trustees	3	15	6	—	—	—
Balance carried forward	117	2	7	77	11	6
Total	£400	15	4	£344	11	2

The capital invested has been increased by the purchase of £100 of London County Council 3 per cent Stock on December 30, 1914, making a face value total of £1,463 10s. 10d. now invested, the various securities representing this sum being shown upon the balance-sheet.

The value of the investments was estimated according to the prices ruling in January, 1915, and, as may be readily understood, show a considerable reduction upon the market prices prior to the war. The investments, however, consist entirely of gilt-edged securities, and it is hoped will proportionately rise with the advent of peace.

CASH ACCOUNT FOR THE YEAR ENDING DECEMBER 31ST, 1914.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Balance brought forward, Jan. 1st, 1914	117	2	7	Grants to orphans:			
Donations	12	15	0	Case No. 1 ...	10		
Subscriptions ...	135	12	6	,, 2 ...	20		
Interest on £148 Portsmouth Corporation 3 per cent stock	4	17	3	,, 3 ...	20		
				,, 4 ...	10		
				,, 5 ...	20		
				,, 6 ...	30		
Interest on £252 L. & N.W.Rly. 4 per cent debenture stock	10	10		,, 7 ...	50		
					160	0	0
Interest on £100 West Ham Corporation 3½ per cent stock	3	1	2	Purchase of £100 3½ London County 3 per cent stock	100	0	0
Interest on £994 15s. 4d. Consols 2½ per cent	6	4	4	Printing, stationery, postages and sundries ...		6	8
Interest on £589 14s. 10d. London County 3 per cent stock ...	16	11	9	Balance	77	11	6
Total ...	£344	11	2	Total ...	£344	11	2

GROSS ASSETS.

	£	s.	d.
Balance of current account	77	11	6
L. & N. W. Rly. stock	176	6	5
Portsmouth Corporation stock	149	2	6
West Ham Corporation stock	86	0	0
Consols	185	6	9
London County stock	564	4	9
Total ...	£1,228	11	10

Examined and approved,
WOOD, DREW & CO.,
Chartered Accountants.

London: 139 Cannon-street, E.C.
2nd June, 1915.

The cash balance available at the end of the year was £77 11s. 6d., as shown upon the balance-sheet hereunto appended, which has been duly audited and found correct by the auditors of the institution, Messrs. Wood, Drew & Co., of 139 Cannon-street, E.C.

The number of subscribers to the fund has been 210, as compared with 227 in 1913; but, on the other hand, the amount of the collections made at the various district meetings has increased from £28 14s. 3d. in 1913 to £43 17s. 9d. in 1914, an appreciable addition to our income which somewhat reconciles us to the decreased subscriptions, as doubtless much of the amount received from these meetings might be reasonably included as subscriptions, although anonymous.

While fully recognising the many calls we have upon us during this period of stress, your committee would, nevertheless, beg the subscribers still to do their best to induce other members of the institution to assist the fund, be the amount ever so small, as with 130 members of the institution now serving His Majesty, it is within the bounds of probability that abnormal claims may be made during the current year, when it is hoped we at home may endeavour to lighten the burden of those who may be left with inadequate means of subsistence.

Charity, they say, begins at home, and it therefore behoves all of us to do our utmost for children of our professional brethren should necessity through this dreadful strife demand it.

At the present time 210 out of the members of the institution are subscribers to the fund, and this, we hope, will be considerably increased when the report of 1915 is published.

The amount of subscriptions and donations for the year 1914 may be divided among the various districts as follows—viz.:—

Name of District.	Donations. £ s. d.	Subscriptions. £ s. d.	Total. £ s. d.
East-Midland ...	2 13 7	19 11 0	22 5 1
Eastern ...	11 13 6	21 18 0	33 11 6
West-Midland		15 15 0	15 15 0
Metropolitan ...	—	17 1 0	17 1 0
North-Eastern ...	3 10 0	13 2 0	16 12 0
North-Western	—	9 19 0	9 19 0
Southern ...		10 9 6	10 9 6
South-Eastern ...	4 17 6	4 11 0	9 11 6
South-Western ...		2 0 0	2 0 0
Welsh (North)	1 10 0	0 15 6	1 6 6
Welsh (South) ...	-	4 13 0	4 13 0
Scottish ...	6 19 2	1 1 0	8 0 2
India and the Colonies ...	1 3 0	2 2 0	3 5 0
Miscellaneous ...	18 13 6	1 1 0	19 13 6
Non-members ...	6 11 0	2 9 0	10 0 0

The number of children benefited by the fund during the year has been twenty-two, but this does not include one child for whom a presentation to the British Orphan Asylum was purchased in 1909, and which expires in 1916.

In all cases every inquiry was made as to the *bona fides* of each applicant for a grant, and your committee have no hesitation in stating that every one of the grantees were sadly in need of help when the fund was opportunely brought to their assistance.

The vacancies upon the committee occurring during the year were filled by the retiring members, Messrs. J. Patten Barber, A. H. Campbell, W. Harpur, and W. H. Leete, while Mr. O. Claude Robson was elected as hon. secretary and hon. treasurer.

We have to report that the Ladies' Committee proposed at the last annual meeting has hitherto been unable to organise any assistance for the fund, but they hope to be more successful at a later date.

List of Donations and Subscriptions for the Year ended December 31, 1914.

Name.	Donation. £ s. d.	Annual Subscription. £ s. d.
East Midland District.		
Baldwin, L. L., Coalville ..		0 10 0
Baxter, J. G. R., Grimsby		0 2 6
Bennett, F. H., Derby		0 5 0
Brown, A., Nottingham		1 1 0
Bunn, W., Sutton-in-Ashfield		0 5 0
Clare, J., Sleaford ..		0 5 0
Clare, S. F., Sleaford		0 1 0
Clark, W. G. J., Wigston Magna		0 5 0
Clarke, R. E., Arnold		0 5 0
Clews, C. A., Derby		0 10 0
Coales, H. G., Market Harborough		0 10 0
Collinge, J. P., Mansfield		0 10 6
Cook, F. P., Mansfield Woodhouse		0 5 0
Gordon, R. C., Belper		0 5 0
Crump, E. H., Hinckley ..	—	0 10 6
Fenn, T., Belper		0 2 6
Frank, T. Pierson, Newark		0 5 0
Gordon, T. W., Nottingham		0 5 0
Gray, C. C., Scunthorpe		0 2 6
Haller, J. C., Nottingham		0 10 6
Hasselbine, W. S. T., Arnold		0 5 0
Hawley, G. W., Nottingham		0 10 6
Henry, T., East Retford		0 5 0
Hodson, C. F., Grimsby		0 5 0
Hooley, E. Purnell, Nottingham		1 1 0
Hopkinson, F., Worksop ..		1 1 0
Horton, J. W., Derby		0 10 6
Jaffrey, W., Matlock ..		0 5 0
Kennedy, J. D., Retford ..		0 5 0
MacBrair, R. A., Lincoln		0 10 6
Mason, S., Grimsby		0 2 6
Mawbey, E. G., Leicester		1 1 0
Maylan, S., Basford		0 10 6
Oakden, E. junr., Newark		0 10 6
Parker, A. L., Oakham ..		0 5 0
Parker, S. W., Grantham		0 10 6
Rawson, G., Worksop		0 10 6
Ryman, F. R., Stamford ..		0 5 0
Savage, J. A., Mansfield		0 5 0
Ward, J., Derby		1 1 0
Watford, P. A., Newark		0 5 0
Whyatt, H. G., Grimsby		1 1 0
Wright, W., Grantham		0 5 0
Wright, F. W., Ilkeston		0 5 0
Collection at Hinckley Meeting (per Mr. J. S. Pickering)	2 13 7	
Eastern District.		
Barrett, E. J., Staines		0 10 6
Brown, R., Southall-Norwood ..		0 10 6
Coales, H. F., Sunbury-on-Thames		0 5 0
Cockrill, J. W., Great Yarmouth		1 1 0
Collins, A. E., Norwich		1 1 0
Collis-Adamson, A. C., Highgate	—	0 5 0
Cooper, L. A., Chiswick ..	1 11 6	0 10 6
Croxford, F. H., Wood Green		0 5 0
Dunn, J. Cambridge		0 10 6
Elford, E. J., Southend-on-Sea		1 1 0
Farrington, W., Woodford		1 1 0
Fisher, R., Willesden		0 5 0
Gladwell, A., Slough		1 1 0
Gregory, W., Hatfield		0 5 0
Harrison, F. T., Chelmsford		0 10 6
Haylor, B., Willesden		0 10 6
Hodges, H. N., Frome		0 5 0
James, A. C., Grays		1 1 0
Jenkin, C. J., Finchley		0 10 6
Julian, J., Cambridge		0 10 0
Leete, W. H., Bedford		1 1 0
Lovegrove, J. E., Hornsey		1 1 0
Neave, J., Walthamstow		0 5 0
Robson, O. C., Willesden ..	—	1 1 0
Savage, W. H., Cockfosters		1 1 0
Siddons, J. M., Oundle		0 5 0
Smith, F. Hall, Sheringham		0 5 0
Smith, T. R., Kettering ..		0 10 6
Smith, W. J., Willesden ..	—	0 5 0
Smyth, J. R., Willesden		0 10 6
Thomas, R. J., Aylesbury		1 1 0
Wakelam, H. T., Westminster		1 1 0
Webb, J. A., Great Stanmore		0 10 6
Willis, E., Chiswick		1 1 0
Collection at Southend Meeting (per Mr. J. W. Dudley Robinson)	7 2 0	
Collection at Chelmsford Meeting (per Mr. J. A. Webb)	3 0 0	
West Midland District.		
Butt, E. E. W., Birmingham		0 5 0
Clarry, W. A. H., Sutton Coldfield		0 10 6
Clarson, H. J., Tamworth		0 5 0
Cook, F. C., Nuneaton		0 10 6
Currall, A. E., Solihull		0 10 6
Davis, A. T., Shrewsbury ..		1 1 0
Douglas, S., Kenilworth ..		0 10 6
Eayrs, T. W., Birmingham		0 5 0
Fiddian, W., Stourbridge ..		1 1 0
Gettings, C. F., Worcester		0 10 6
Greatorex, A. D., West Bromwich		1 1 0
Green, G., Wolverhampton		1 1 0
Howell, A. P., Birmingham		0 5 0
Jack, G. H., Hereford		0 10 0
King, J. Stuart, Birmingham		0 5 0
Lacey, G. W., Oswestry		0 10 6
Perkins, J., Birmingham		0 5 0
Plant, W., Stafford		0 10 6
Ransom, W., Worcester ..		0 2 6
Richardson, R., Birmingham		0 5 0
Rogers, W. E., Rugeley		0 10 6
Shipton, T. H., Oldbury		0 5 0
Stilgoe, H. E., Birmingham		1 1 0
Watson, J. D., Birmingham		1 1 0
Willcox, J. E., Birmingham		1 1 0
Willmot, J., Leamington ..		1 1 0
Woodward, F., Stourbridge		0 10 6
Metropolitan District.		
Barber, J. P., Islington ..		1 1 0
Blair, W. N., St. Pancras		1 1 0
Boulnois, H. Percy, Westminster		1 1 0
Cole, T., Westminster		1 1 0
Finch, A. R., Kensington		1 1 0
Giles, H. A., Westminster		0 5 0
Hayward, T. W. A., Battersea		1 1 0
Higgens, T. W. E., Chelsea		1 1 0
Killick, J. S., Westminster		0 10 6
Killick, P. G., Finsbury		1 1 0
Maybury, H. P., Westminster		1 1 0
Moss-Flower, T. J., Westminster		1 1 0
Silcock, E. J., Westminster		2 2 0
Sumner, F., City Corporation ..		1 1 0
Van Putten, E., Catford		1 1 0
Willcocks, G. Waller, Roehampton		1 1 0
Winter, O. E., Hampstead		0 10 6
North-Eastern District.		
Beaumont, A., Beverley		1 1 0
Burton, W. E. H., Wakefield ..		0 10 6
Dickinson, R., Berwick-on-Tweed		0 5 0
Lester, H. P., Leeds		0 2 6
Gore, W., Castleford		0 5 0
Hadfield, W. J., Sheffield		1 1 0
Hart, G. A., Leeds		0 10 6
Hayward, S., Pontefract		0 5 0
Ives, L., Wakefield		0 10 6
Kirby, T. O., Doncaster ..		1 1 0
Lancashire, W. F., Leeds		1 1 0
Lund, C., Cleckheaton	—	0 5 0
Martin, E. B., Rotherham		0 10 6
Massie, F., Wakefield		1 1 0
Matthews, E. R., Bridlington		0 5 0
Roseveare, L., South Shields		0 10 0
Rothera, A., Liversedge ..	—	0 2 6

Name.	Donation	Annual Subscription
	£ s d	£ s d
Southwaite, J., Rothwell, near Leeds	0 2 6	
Steele, W. J., Newcastleon-Tyne		1 1 0
Thackray, F. J., Royland Nether		0 5 0
Thompson, G. W., Happerholme		0 5 0
Wakeford, J. P., Wakefield		0 10 6
Wike, C. E., Sheffield		0 10 0
Wilson, R. E., Leiston		0 2 6
Wrigley, G. E., Sowerby Bridge		0 5 0
Collection at Wakefield Meeting (per Mr. J. P. Wakeford)	3 7 6	
North-Western District.		
Brodie, J. A., Liverpool		1 1 0
Brodie, J. S., Blackpool		1 1 0
Diver, D. J., Marple		0 10 6
Heath, J., Urmston		0 5 0
Hellawell, O., Withington		0 10 6
Meade, T. de Courcy, Manchester		1 2 6
Platt, S. S., Rochdale		1 1 0
Price, A. J., Lytham		0 10 6
Smith-Saville, R. W., Darwen		0 5 0
Stubbs, W., Blackburn		0 10 6
Travers, W. H., Wallasey		0 10 6
Wilding, J., Runcorn		0 10 6
Wiles, J. W., Manchester		0 10 6
Wolfenden, B. J., Bootle		0 10 6
Worrall, E., Manchester		1 1 0
Southern District.		
Frost, H., Gosport		0 10 6
Gaulbert, T. J., Guernsey		1 0 6
Hawkins, J. F., Reading		0 10 6
Jones, Lieut.-Colonel A. S., Finchampstead		1 1 0
Lemon, Sir J., Southampton		1 1 0
McKenzie, L. S., Bristol		1 1 0
Phipps, F. E., Basingstoke		0 10 6
Pickering, J. S., Cheltenham		0 10 6
Read, R., Gloucester		1 1 0
Stallard, S., Oxford		1 1 0
White, W. H., Oxford		1 1 0
Yabbicom, T. H., Bristol		1 1 0
South-Eastern District.		
Bushridge, T. A., Maidstone		0 10 6
Grant, F. T., Gravesend		0 10 6
Howard, H., Littlehampton		0 10 6
Jones, H. O., Folkestone		0 5 0
Norris, J. H., Godalming		0 10 6
Palmer, P. H., Hastings		1 1 0
Scott, H. H., Hove		1 1 0
Wilkinson, F., Wimbledon		0 5 0
Collection at Salisbury Meeting (per Mr. J. W. Dudley Robinson)	2 11 0	
Collection at Dover Meeting (per Mr. J. W. Dudley Robinson)	2 3 6	
South-Western District.		
Chapman, H. T., Wells		1 1 0
Chowins, W. H., Burnham		0 5 0
Hutton, S., Exmouth		0 10 6
Saunders, E. Y., Barnstaple		0 10 6
Stephens, R., Ilminster		0 2 6
Welsh District (North).		
England, J., Wrexham		0 10 6
Jones, E. W., Denbighshire	0 10 6	
Morgan, R. P., Towyn		0 5 0
Welsh District (South).		
Bell, G., Swansea		0 10 6
Bell, G. H., Swansea	—	0 5 0
Harpur, W., Cardiff		1 1 0
Harpur, W. L., Brecon		0 5 0
Harvey, F. F., Merthyr Tydvil		0 10 6
Holden, L., Cardiff		0 2 6
Hybart, F. R., Barry		0 5 0
Jones, D. L., Merthyr Tydvil		0 2 6
Priestly, C. H., Cardiff		0 10 6
Read, F., Pentre, Rhondda		0 10 6
Rimell, H. C., Cardiff		0 5 0
Shellard, I. F., Newport, Mon.		0 5 0
Scottish District.		
Campbell, A. H., Edinburgh		1 1 0
Collection at Dunfermline Meeting (per Mr. J. W. Dudley Robinson)	6 19 2	
Indian District.		
Salkield, T., Delhi		1 1 0
Abroad.		
Bush, W. E., Auckland, N.Z.		1 1 0
Galbraith, A. R., Sydney, N.S.W.	1 3 0	
Miscellaneous.		
Collection at Annual Meeting of Institution (per Mr. J. S. Pickering)	15 18 0	
Lower Thames Valley District Surveyors' Association	—	1 1 0
"Ripples"	0 12 6	
Sale of Fifty Copies of Paper, "Steam Rolling" (per Mr. E. Purnell Hooley)	2 2 0	
Non-Members of Institution.		
Biggs, Mrs., Richmond		0 10 6
Carpenter, F. G., Wakefield	—	0 10 6
Cooper, C. H., Wimbledon	1 1 0	1 1 0
Humphreys, H. H., Westminster		1 1 0
Mansergh & Sons, Westminster	—	1 1 0
Renwick, H., Horsham	0 5 0	
Editor, THE SURVEYOR		5 5 0
Vesian, J. S. E. de	5 5 0	

The CHAIRMAN moved the adoption of the report.

Mr. H. G. WHYATT remarked that the reason why the ladies had not been able to do anything during the year was because their efforts had been directed to other channels since August. Inasmuch as there was a possibility of further demands upon the fund as the outcome of the war, he was rather sorry to find that the number of subscribers remained so small. At the same time it was satisfactory that the total receipts were so well maintained.

Mr. J. W. COCKRILL said it was not an easy matter for the ladies to hold a meeting, and as a consequence the business of their committee must necessarily be done by correspondence.

Mr. H. PERCY BOULNOIS asked if it was possible for the parent institution to subsidise the Orphan Fund in any way. It was not creditable to the members that the fund was not better supported. Would it not be possible, for instance, to set aside the profits from the "Journal" to aid the fund?

The CHAIRMAN stated that the matter had been discussed, and that it was found impossible to do anything of the kind suggested under the Articles of Association.

Mr. BOULNOIS, with the permission of the chairman, eventually moved that the council be asked to consider whether it would be possible, under the Articles of Association, to render financial support to the Orphan Fund by devoting the profits arising from the "Journal" towards the fund.

Mr. COCKRILL seconded, and the proposition was agreed to unanimously.

It was announced by Mr. THOMAS COLE that in the ballot for the election of the committee the list had been elected unanimously. The CHAIRMAN explained that the vacancy caused by the resignation of Mr. A. H. Campbell (Edinburgh) had been filled by the election of Mr. Thomas Cole.

Mr. E. WILLIS proposed the re-election of Mr. O. Claude Robson as hon. secretary and hon. treasurer.

Mr. G. W. LACEY seconded, and the motion was agreed to with unanimity.

Mr. ROBSON, in again accepting office, insisted upon the necessity for younger blood being introduced. It appeared to him that the proportion of subscribers to the membership of the institution was far from satisfactory. If they only had a thousand members subscribing, say, 5s. apiece yearly, the position of the fund might be pretty well assured. It was not satisfactory that there were only 220 subscribers to the fund.

Mr. COCKRILL said he did not regard the position as being unsatisfactory, and he was sure that if there happened to be a larger demand upon the fund the members would rise to the occasion. There was no occasion to be pessimistic.

THE NEW PRESIDENT.

Mr. Henry T. Wakelam, M.INST.C.E., F.G.S., the new president of the Institution of Municipal and County Engineers, has had many years' experience in his profession. He commenced his career by serving with a mining engineer, and afterwards served a five-years' pupilage with a civil engineer and architect with both public and private practice. At the expiration of his articles Mr. Wakelam acted as resident engineer under the late Mr. W. H. Wheeler, M.INST.C.E. (well known in the Eastern Counties), and as resident, deputy and chief in other positions. Seventeen years ago he was appointed county surveyor and architect by the county council of Middlesex, receiving, some fifteen years ago, by resolution of that council, the designation of county engineer.

During the time Mr. Wakelam has held his appointment in Middlesex he has had charge and control of the engineering, architectural and surveying work of the county, which has embraced extensive light railway and tramway schemes, between forty and fifty bridges, and extensive works including new roads, improvements, and widening works. The last-mentioned included the construction of many miles of new sewers, and the diversion and laying of many miles of gas and water mains, ranging from 6 in. to 42 in. in diameter. The total amount expended on the schemes exceeded £2,000,000 sterling. Since his appointment to Middlesex Mr. Wakelam has also controlled an expenditure of between £2,000,000 and £3,000,000 more. At present he has in hand the construction of the new Great West Road, which is estimated to cost just over £500,000 sterling.

During his association with the rapidly growing area of which he has charge, Mr. Wakelam has carried out many new buildings, including petty sessional courts at Acton, Brentford, Ealing, Enfield, Hendon, Feltham, and Harlesden, and other buildings, the cost of these amounting to about £60,000. He has also recently acted in collaboration with Mr. J. S. Gibson in connection with the erection of the new Guildhall for Middlesex, at a cost of some £80,000.

In connection with the County Rivers Pollution (Special) Acts, Mr. Wakelam has under his charge about 125 miles of rivers and streams, upon which a large number of men are constantly employed in cleansing

and widening operations, and so forth. In this branch he exercises supervision, so far as pollution is concerned, over the many public and private sewage outfalls in the county. Mr. Wakelam controls also the upkeep, widening works and improvements carried out in connection with the main roads directly maintained by the county council. In this department he has kept pace with the times in all matters relating to the methods of resurfacings to meet the requirements of modern traffic. His experience has covered arbitrations and negotiations, a large amount of Parliamentary work (both in promotions and oppositions) in regard to Railway Bills, Tramway Bills, Road Bills, Electric Light Bills, water supplies and sewage schemes.

Previously to his present appointment Mr. Wakelam acted as county surveyor and architect to the Herefordshire County Council, in which position he had charge of some 500 miles of main roads, about 400 county bridges, and the county buildings.

He was admitted an associate-member of the Institution of Civil Engineers in 1883, and was transferred to the class of member in 1900. He joined the institution of which he is now president in 1888, and has been a Fellow of the Geological Society for many years. Mr. Wakelam is a past-president of the County Surveyors' Society, and a past (co-opted) president of the Institute of Sanitary Engineers. He is on the Board of Examiners, and was recently re-elected chairman of the Eastern District of the Institution of Municipal and County Engineers, and has been a frequent contributor of papers for discussion at the various gatherings of the institution and otherwise. He has also been chairman of the Roads Committee of the institution. He is a member of the Highways Committee of the County Councils Association, and was also a delegate to the Road Congresses held in Paris and Brussels.

Mr. Wakelam formerly held commissions as Lieutenant in the 6th Lancashire Artillery and as Captain in the 1st Herefordshire Rifles.

It will be within recollection that Mr. Wakelam was one of those left in the final selection for the appointment of chief engineer under the London County Council, withdrawing therefrom at the last moment.

Arterial Roads in Greater London: Southern Section.—At a meeting of the Southern Sectional Conference at the Local Government Board offices on Friday last, recommendations for the construction of roads connecting Merton and Sutton and Lordship-lane Station with Clapham Common, and for a by-pass road at Epsom, and extending the proposed Croydon by-pass road, were considered. The proposals regarding the Merton and Sutton and the Lordship-lane and Clapham Common roads were agreed to, but that with reference to the Croydon by-pass road was referred back to the sub-committee for further consideration.

National Guard Engineers.—On the 12th inst., by permission of Colonel Sir Edward Raban, K.C.B., R.E., a detachment of the City of London National Guard Engineers' Unit, under Colonel C. E. Cassal, V.D. (Commandant), visited some of the entrenchments constructed for the defence of London under the supervision of the Corps of Royal Engineers. The National Guard Engineers were received by Colonel W. Pitt, C.B.E., who showed and explained the works, which form part of those constructed by infantry battalions of the New Army under the direction of civil engineers, who have lent their services to the War Office, supervised by a R.E. officer for each length of from 15 to 20 miles.

Relief for Professional Classes.—The Professional Classes War Relief Council issues a report of six months' work which shows at once not only the great need that existed for such an organisation, but the variety of means that have been employed. The applications during the six months ending May 6th numbered 2,000, and the number of cases dealt with or now on the books is 1,600. One hundred cases were referred to other societies. The expenditure is now at the rate of £430 per week, and unless a sum of £25,000 can be raised in the next few months the work cannot be continued. It must be reiterated that no other body is doing exactly the same kind of work, in trying by co-ordination of existing benevolent funds, as well as by their own specialised forms of assistance, to tide over the professional classes who are so heavily penalised by the war. The offices of the council are 13 and 14 Prince's-gate, S.W.

TOWN PLANNING IN SCOTLAND.*

By Jas. Thomson,
City Engineer of Dundee.

In submitting a few notes on "Town Planning in Scotland," it will be appropriate, notwithstanding the possibilities of the subject, that any observations I have to make on what is being done in the North should be general rather than detailed or statistical.

Several enthusiastic students of town planning—legal, engineering and architectural—who are engaged on town planning schemes for the cities of Edinburgh, Glasgow, Dundee and Dunfermline, and for the county of Lanark, have been for some time, and will continue to be, engaged at meetings held periodically in these cities considering the provisions of the Act of 1909, and adjusting their draft schemes to the requirements of towns and counties in Scotland.

The result of these conferences will certainly be that a degree of uniformity in the preparation of schemes will be reached which could not be attained by individual action, and that the work of the Local Government Board for Scotland in the revisal and disposal of applications will be greatly facilitated.

It must not be assumed, however, that any attempt is being made to standardise the schemes, because the requirements of the respective districts, in many instances, differ materially. To standardise is impossible, but it is believed that, with the combined legal, engineering and architectural experience of those taking part in the conferences a certain amount of uniformity and a general understanding will be arrived at on many points as to which there might otherwise be different conclusions and varying styles of expression.

For example, it is possible to be in agreement, or nearly so, regarding methods of preparing schemes, as to what should be the minimum width of streets, the minimum width between building lines, the maximum height of buildings, the minimum size of rooms, the minimum height of ceilings, the minimum open space about dwelling-houses, the minimum of sanitary conveniences, the maximum height of boundary walls and fences, as to advertising hoardings, interpretation of terms, penalties, and as to the extent to which control should be had over elevations by the responsible authority.

On the other hand, each responsible authority, having regard to local conditions and requirements, must judge for itself as to the maximum width of roads and the mode of construction; the number of dwelling-houses to the acre; as to whether there should be flatted tenements, and the height of these; whether houses of one room should be permitted; as to allowing temporary formation of streets; the extent to which owners should be relieved of the cost of forming wide roads, and as to the size and form of units.

Housing conditions in Scotland, it is well known, differ in some respects from the conditions prevailing in England, and that fact, to a moderate extent, has an effect on schemes of town planning in the former compared with schemes in the latter. The difference is not pronounced, but it exists nevertheless, and will be found particularly in districts in close proximity to industrial areas. With that exception it may be assumed that the application of town planning in Scotland is fairly uniform with the application in England.

Scottish Town Planning Schemes.

I cannot compare with certainty the progress of town planning in Scotland with the progress in England, but it may be interesting to know that in Scotland, up to the present time, the Local Government Board for Scotland have authorised the preparation of twenty town planning schemes, varying in area between 1,070 acres and 44 acres, and representing altogether an area of over 16,000 acres. These figures speak for themselves as to the success of the Act so far as it applies to Scotland.

Nor can I from personal knowledge deal with the necessities of England for a Housing and Town Planning Act; but I can, from intimate acquaintance with the three large cities of Scotland, speak to the fact that in Scotland the passing of the Act was welcomed by local authorities as a boon the benefits of which cannot yet be estimated, and this meeting may rely that the local authorities of Scotland are very much alive to the advantages to the whole community of the provisions of the Act, and,

* Paper read at a meeting of the Town Planning Institute on Wednesday.

National Road Exhibition.

OFFICIAL OPENING TO-DAY.

THE EXHIBITS.

To-day (Friday) the National Road Exhibition, organised primarily by the County Councils Association, will be officially opened at the Royal Horticultural Hall, Westminster, by the Right Hon. Walter Long, M.P., President of the Local Government Board. The chair will be taken at 1 p.m. by the Right Hon. Henry Hobhouse, chairman of the Somerset County Council. In the ordinary course of events the Fourth International Road Congress and Exhibition would have been held at Munich in March, 1916, but owing to the war this has been abandoned, and nothing definite has been decided with respect to it or any similar international congress. While the clash of arms has thus rudely disturbed the triennial congress, road problems still remain as pressing as—even more pressing than—ever, and it is the recognition of this that induced the County Councils Association to take the bold step of arranging, in co-operation with the Road Board, the Institution of Municipal and County Engineers, and the County Surveyors' Society, for a conference on lines similar to that held under the auspices of the association in 1909. The opening sitting of the conference will take place on Monday next.

There would appear to be special reasons for holding the conference and exhibition at the present juncture. It is pointed out that the heavy traffic due to an enormous mass of military transport in this country, together with the destruction of roads in many parts of Belgium and Northern France, tend to raise problems differing in degree and to some extent even in kind from those which have been previously submitted for consideration. A flood of illuminative light will be cast upon these problems by the discussion of papers by authorities on road construction and classification, while at the same time the exhibition will serve the practical end of bringing together the latest plant and machinery which the skill and enterprise of inventors and manufacturers have placed upon the market. While the war is yielding its present problems, which call for serious consideration, it is none the less important to bear in mind that in the future many grave issues will have to be dealt with, and not the least of these are the schemes of road improvement which have recently been prepared by county councils and other authorities, with the approval of the Road Board, to provide relief in the event of unemployment, which is anticipated as the result of releasing large bodies of men from military service.

The exhibition includes many of the principal firms connected with the road-making industry. The exhibits at the Horticultural Hall will consist chiefly of road materials, while a building in Greycoat-street, adjoining the hall, has been reserved for machinery and appliances.

The Organising Committee, it may be stated, includes the following:—

The Right Hon. H. Hobhouse (chairman of the Somerset County Council), chairman, Mr. J. Aspell (chairman of the Lancs. Highways Committee), Mr. H. Hampton Copnall (clerk to the Notts County Council), Colonel G. Dixon (chairman of the Cheshire County Council), Sir H. G. Fordham (chairman of the Cambridge County Council), Mr. T. H. B. Heslop (county surveyor of Norfolk), Mr. W. Rees Jeffreys (secretary to the Road Board), Mr. A. C. Pain (chairman of the Surrey Highways Committee), Mr. R. S. W. Perkins (county surveyor of the Isle of Ely), Mr. J. W. Dudley Robinson, B.Sc.(Lond.) (secretary Institution of Municipal and County Engineers), Mr. O. Claude Robson (engineer to the Willesden Urban District Council), Mr. H. E. Stilgoe (city engineer, Birmingham), and Mr. H. T. Wakelam (county engineer of Middlesex and president of the Institution of Municipal and County Engineers).

Mr. G. Montagu Harris, secretary of the County Councils Association, is the organising secretary, Mr. Francis Hyndman is assistant secretary, and the onerous task of business manager has been entrusted to Mr. A. F. May.

A special feature of next week's proceedings will consist of one of a series of conferences on the rebuilding of Belgium, with general reference to the destruction of the roads by war operations and military traffic. The paper on this subject is by M. Henri Vandervin, ingénieur et chef directeur des ponts et chaussées de Belgique.

GEORGE F. WEST & CO.

(Stand 14.)

Messrs. George F. West & Co., Caxton House, Westminster, are exhibiting examples of their lock woven mesh for concrete reinforcement (Nos. 40 and 14 mesh). Lock woven mesh reinforcement is woven of best quality drawn-steel wire having an ultimate strength of 88,000 lb. per square inch, and an elastic limit of 66,000 lb. per square inch. It can be laid by totally unskilled workmen, as the junction of the main and distributing wires are securely tied. It is impossible, therefore, unintentionally to change their positions in the slightest degree either before or after laying. Lock woven mesh is made in twenty-four styles, with square-inch sectional areas per foot of cross-section varying from ·0318 to ·4347. It is supplied in long length rolls, 4 ft. wide, as standard; other widths by special arrangement.

The company's Peerless woven wire fencing, heavy and light makes of which are exhibited, is the result of long experience. The principle kept in view is making provision for elasticity in a wire fence to meet varying changes in temperature; this is secured by the use of specially drawn and tempered steel wire of a quality standing almost double the tensile strain of ordinary soft fencing wire. The horizontal or "line" wires are securely bound together at regular

close intervals by upright wires, thus preventing the spreading of the horizontal wires. It is therefore eminently suited for the fencing of roads and railways, and for estate work generally, being strong enough to resist horses and heavy cattle, and yet close enough to keep out sheep and lambs.

AILSA CRAIG GRANITES, LIMITED.

(Stand 11.)

Samples of setts, cubes, chips, metal, briquettes and macadam make an interesting exhibit at the stand of the above company.

W. & F. ARCHER.

(Stands 32 & 33.)

Messrs. W. & F. Archer, Brettenham Brush Works, Edmonton, N., are exhibiting their road brooms at these stands.

CROMBIE'S PATENTS, LIMITED.

(Stands 64 & 65.)

An electrolytic system of sewage disposal will be brought to the notice of visitors to the exhibition by Crombie's Patents, Limited, Blomfield House, E.C. The crude sewage is run, without preliminary filtration, into the tanks containing the electrodes of special alloy. The anodes and cathodes are arranged alternately in the tanks, each plate sliding into grooves in the wall of the tank, and being so arranged that the maximum electrolytic action is obtained. The crude sewage, entering at the bottom of the tank, passes horizontally along the surface of each plate, and eventually leaves by the exit pipe, which is placed at the top of the tank. After passing through the electrolytic tanks, the treated sewage is run into settling tanks, where the suspended matter is deposited, and finally down a stoneware tower containing charcoal. The company claim that this fully treated effluent can be turned into any small stream or ornamental water without any undesirable effects whatever resulting.

TRUSSED CONCRETE STEEL COMPANY, LIMITED.

(Stand 5.)

The two main features of the above firm's exhibit will be their Hy-Rib material and their Atlas reinforcement for concrete roadbeds, and the attention of municipal and county engineers will be specially directed to the following:—

(1) Curved Hy-Rib, suitable for use in forming the concrete top of arched culverts. The closeness of the Hy-Rib lath does away with the necessity for any timber centering.

(2) Sample short length of Hy-Rib completely curved in the form of a pipe, suitable for use in pipe culverts.

(3) Sample of flat Hy-Rib, as used in ordinary building and partition work, exhibited in conjunction with the new type of pressed-steel section. These pressed-steel sections are sent out so that they can be easily fitted together, and special fastenings are provided for attaching to the Hy-Rib material.

(4) Atlas reinforcement for concrete road-beds. This is a new type of reinforcement for concrete road-beds, the advantages of which will be apparent on inspection. The sound engineering construction of the material, and the unlimited variations which can be made, both in the size of the spacing and the bars, are features which will readily commend themselves to all interested in concrete road-beds. The company are also exhibiting their Trus-Con waterproofing paste, which has been used by many of the leading corporations.

UNITED STATES STEEL PRODUCTS COMPANY.

(Stand 29.)

The above firm, whose London address is 36-38 New Broad-street, E.C., are exhibiting their triangle mesh concrete reinforcement. This mesh is made of cold drawn steel wire with a tensile strength of 85,000 lb. per square inch, and an elastic limit of 50,000 lb. per square inch. This is claimed to be far in excess of the strength possessed by any hot-rolled product, and it is therefore possible to use a much lighter weight of steel to obtain a given strength. The mesh is supplied in 18-in., 22-in., 26-in., 30-in., 34-in., 38-in., 42-in., 46-in., 50-in., 54-in., or 58-in. widths, and 150-ft., 200-ft., or 300-ft. lengths. The distance between longitudinal members is 4 in., and between cross-wires 2 in. or 4 in., as required. There are twenty-three styles, having a cross-section of steel per foot width of 0·41 to ·380 sq. in., the weight varying from 21 to 130 lb. per 100 sq. ft.

The British Fire Prevention Committee tested this material under fire and water, when classification "full protection" (Class B) was obtained. After the official test the floor was allowed to cool, and then reloaded with a load of 5 cwt. per square foot. The floor showed no signs of failure, and the deflection of the slab below the beams was only 0·4 in. Full particulars of these tests may be had on application for the committee's Red Book, No. 169. The material is particularly adapted for reinforced concrete slabs, partitions, beam and column wrapping. Being of the hinged joint construction, it can be bent or folded to a square or circle without deforming the cross wires or producing an initial stress. It is therefore very suitable for columns or piles. It is also particularly suited to reinforced concrete pipes. Many engineers who have been using concrete pavements have commenced to use steel reinforcement, thereby eliminating temperature cracks and reducing the necessary thickness of concrete required. It has been suggested that the cost of making trenches or repairs would be very high, but it has actually been shown that the cost is less than similar work on a stone pavement. A trench was made in 6½-in. thickness by drilling holes 12 in. apart and breaking the concrete between. This was replaced by work exactly the same as the original work, and cost 25 per cent less than would have been the case for a stone or brick pavement.

CAMBRIAN GRANITE QUARRIES, LIMITED.

(Stand 7.)

This company are proprietors of the Llanbedrog Granite Quarries, North Wales, which has a high name among road surveyors and engineers for its excellent qualities as a road macadam. Their exhibits are paving setts, cubes, machine-broken road macadam, and chippings. As a striking testimony to the quality of the Llanbedrog setts may be instanced the fact that some of these setts which had been laid for over forty years on a tramway in one of the busiest streets of Manchester were taken up recently, and found to show practically no sign of wear at all. In order to obtain an independent proof, the granite has been submitted to the standard tests for hardness and toughness carried out by the Road Board at the National Physical Laboratory, Teddington, and the results were stated to indicate that the quality of the stone is excellent as regards both toughness and attrition.

ALEXANDRA PAVING STONE COMPANY, LIMITED.

(Stand 7.)

The Alexandra Paving Stone Company, Limited, Vernon House, Sicilian-avenue, Southampton-row, W.C., are showing their well-known productions of Alexandra stone paving. At their Leicester works they manufacture their stone with 3 parts ¾-in. washed Leicester granite and 1 part best tested Portland cement. The matrices are specially graded, and the concrete thoroughly mixed and well made. The company has for the past twenty-five years supplied most of the principal towns, London and provincial corporations, urban district councils, railways and docks in England and Wales. The best testimonial, perhaps, that the company can possibly have is that its first customers have been and are still regular buyers. The company has over 70,000 yds. of 2-in. and 2½-in. thoroughly matured paving in stock, and can supply any orders at a few hours' notice. The company run another branch of the business for the building trade, and can execute any orders, however large, for architectural stone dressings, staircase work (cast or in situ), granolithic paving, Roman, mosaic, terrazzo paving, and so forth.

SIMPSON & CO.

(Stand 22.)

Messrs. Simpson & Co., 59 Victoria-street, S.W., are exhibiting plans and a working model of a patent mechanical hammer, which will be found of value for breaking up concrete road foundations and other similar work which is at present performed by navvies. It is claimed it is not only valuable as a labour-saving appliance, but works with precision, and wields a hammer [illegible] can be used by workmen. Demonstrations will be given at frequent intervals.

TAROADS SYNDICATE, LIMITED.

(Stand 28.)

The Taroads Syndicate, Limited, of 9 Victoria-street, Westminster, S.W., who are to be found at Stand 28, has in spite of the disorganisation of transit facilities which has necessarily resulted from military requirements in the shape of the conveyance of troops and war supplies, made successful progress in the contracts which it has undertaken.

The surface-spraying of roads with tar is a matter of extreme importance during war-time. The even distribution and penetration tend, as is universally appreciated, to strengthen, solidify and preserve the crust of the highways, so as to withstand the ravages of the exceptional and ponderous traffic caused by the transport of artillery, motor lorries and military equipment, materials and supplies, while the absence of dust, wherever roads have been tarred, is highly beneficial to troops on the march.

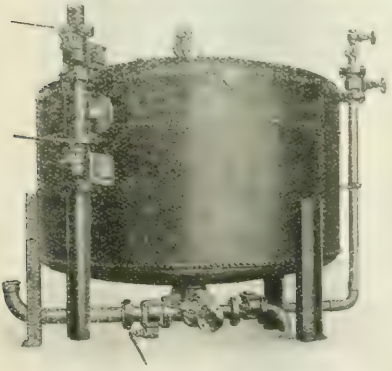
The syndicate's long experience in this class of contract, and the special facilities at its disposal, enables it to execute its work in a first-rate manner and with marked celerity. The mileage that will be sprayed during the present season constitutes a new record. Each of the highly efficient tar-spraying machines owned in large numbers by the syndicate is capable of spraying as much as 20,000 sq. yds. per diem, and surpasses, it is claimed, in speed and efficiency all other methods for the surface-treatment of roads; so that the advantages accruing to the roads may be enjoyed for the maximum period of the otherwise dust-infected months of the year.

The surface-treatment of roads by the syndicate's machines effects considerable economy in watering, scavenging and upkeep, and, inasmuch as the crust is consolidated by tar penetration, the life period of the road is prolonged.

WILLIAM BOBY.

(Stand 93.)

William Boby's exhibit consists of water-purifying appliances, including their well-known "Simplex" and "Type K" water softeners, filtration plant, and their sterilising system for treating contaminated waters so as to render them suitable for potable purposes. Their water softeners are represented by an example of their patent oscillating automatic water measuring and liquid reagent distributing gear; a lime solution preparing and pumping apparatus, and a complete "Type K" powder reagent machine.

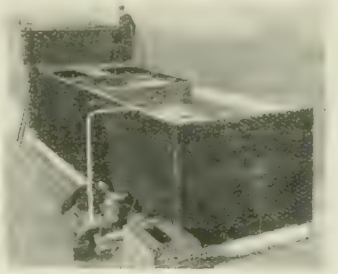


PRESSURE FILTER, WATERWORKS TYPE.

latter being at work. We are informed that a much larger display of their machines was intended, but press of Government orders for their specialities has prevented the possibility of completing any work for the exhibition other than the examples above mentioned.

A handsome model of a waterworks type of pressure filter is shown, also one of their patent distributors for sterilising reagents, the latter being at work. This distributor possesses special interest at the present time from the fact that one of them was in use in Belgium in the Hasselt waterworks up to the outbreak of war, and possibly still remains at work there.

Photographs are exhibited of a neat arrangement of pumping, filtration and purified water storage plant recently supplied by the firm to a Colonial Government Department. There are also numerous photographs and drawings of important installations of softening and purifying plants which have been supplied to municipal bodies, railways, hotels, public and private baths and laundries in various parts of



WATER SOFTENER FOR PUBLIC SUPPLIES.

the Kingdom, the Colonies and the East. There is also a drawing showing the firm's arrangement of bath-water refiltration, embodying a patented form of filter, and several special features which we think will be found of interest to municipal engineers who are contemplating the erection or improvement of public swimming baths.

BIRTLEY IRON COMPANY.

(Stand 16.)

The Birtley Iron Company, Birtley Ironworks, Birtley, Co. Durham, are showing cast-iron pipes for sewerage, gas and water purposes, lamp columns, plain and ornamental fencing, Norton patent surface boxes, manhole, gully, inspection, meter, hydrant [illegible] covers, sluice valve and [illegible]. The special feature of the Norton patent surface boxes, as pointed out in these columns on June 12, 1914, is that their construction permits of broken, smooth or dangerous covers being removed and new ones refixed in a few minutes without disturbance to the frame or roadway or interference with traffic—an arrangement which, as engineers will be quick to realise, makes for very considerable savings in cost of repairs. The boxes, of which there are now over 8,000 in use, are arranged with a specially designed cover with a loose hinge fitted into recesses, which are white metal blocks forming a non-corrodible bearing for the hinge, thus preventing rusting up. There are no bolts or nuts of any description, and the blocks are interchangeable—in fact, simplicity of construction is the keynote of the design throughout—while combining all the advantages of an interchangeable lid, and are fitted with a double hinge which enables them, when open, to lie flat on the roadway. One water company in England spent, between 1902 and 1914, £8,470 for between 9,000 to 10,000 cases, a large proportion of this being made up in the cost of paving, labour, and removal of old cases. In the new system of Norton's patent the whole total cost during these twelve years to this particular water company would have been only £847, which is exactly 10 per cent of the money actually spent during the twelve years.

EDISON ACCUMULATORS, LIMITED.

(Stands 82, 101 & 102.)

An interesting feature of the display arranged by Edison Accumulators, Limited, 2 and 3 Duke-street, Piccadilly, S.W., is their accumulator tipping wagon. The vehicle exhibited is of 2 tons capacity, designed especially for dealing with the removal and collection of house and street refuse, transport of coal and heavy materials generally. It is equipped with an electrically-operated automatic tipping gear, all electric drive and other special features which have gained acceptance by a number of important municipal boards on account of the great simplicity, reliability, economy and durability which the Edison "Electric" system makes available. This wagon can average 40 miles per charge.

SHARP, JONES & CO.

(Stand 91.)

This well-known Parkstone, Dorset, firm are showing their patent rock concrete tubes for sewers and culverts, and patent Aqualite manholes.

HIGHWAYS CONSTRUCTION, LIMITED.

(Stands 31 & 46.)

Highways Construction, Limited, are exhibiting their system of voidless asphalt macadam road construction by means of sections of roads, and an interesting collection of photographic enlargements. Emphasis is laid on the scientific character of the system in the specimens of bitumen, sand and filler carefully proportioned, which are shown in series together with some of the scientific testing apparatus used in the company's laboratories.

The company has recently adopted as a trade mark the word "Monolastic," as it was found desirable to have a term which could be registered in all countries for their system of voidless asphalt macadam roads.

A new brochure, profusely illustrated with photographs of the company's work in all parts of the country, is issued. Attention is drawn to the fact that Monolastic roads have successfully withstood the continuous and heavy rains of the autumn and winter, and the exceptionally heavy military traffic which has been passing over the roads of the country during the past ten months. These two circumstances—namely, the weather and the war traffic—constitute a maximum test for all road systems, and for the Monolastic roads to have emerged so successfully from this test is convincing proof of the efficiency of the system.

It was intended to exhibit one of the company's patent mixing plants—which, by the way, are constructed at their own engineering works—but as all the plants are busily occupied it is not found possible to do this. An enlarged photograph, however, gives a very good idea of the mixing machine used for Monolastic, and the company's officials will gladly arrange for surveyors to inspect such a machine now operating in London.

GIANT'S CAUSEWAY COLUMNAR BASALT COMPANY, LIMITED.

(Stand 2.)

The exhibits of the Giant's Causeway Columnar Basalt Company, Limited, Portrush, consist of columnar basalt hand and machine broken macadam of various gauges, columnar basalt chippings for ferro-concrete, tar-macadam, fine chippings for tar-spraying, artificial paving (either in slabs or situ), concrete tubes, basaltic columns for sea defence works, groynes, sea and dock walling. Columnar basalt is classed among the finest road material known, owing to its great cleanliness, strength and durability. Its crushing strain (Kirkaldy's test) is 52,653 lb. per square inch. Basaltic columns are used as building stone for sea defence works, groynes, dock walling, embankments, and so forth. The company's quarries are situated within easy distance of Portrush, Co. Antrim. New loading bins have been erected at the harbour, Portrush, for quick discharge to steamers.

STOTHERT & PITT, LIMITED; T. L. SMITH & CO.

(Stand 74.)

Messrs. Stothert & Pitt, Limited, 38 Victoria-street, S.W., and T. L. Smith, 13 Victoria-street, S.W., have arranged a joint exhibit of a No. 0 Smith mixer which is capable of mixing tar-macadam or concrete. The machine has an unmixed batch of 8½ cub. ft. It is mounted on skids, and fitted with a feed spout and fast and loose pulleys for belt drive; 4 b.h.p. is required to drive this mixer. The mixer can be fitted with various accessories, particulars of which can be obtained at the stand. The drum of this mixer tilts to discharge, and as it revolves during the operation a very rapid and efficient discharge is obtained. The gearing is placed as far as possible from the points of both feed and discharge, and there is thus practically no possibility of the gearing becoming clogged with the materials being mixed.

GAS LIGHT AND COKE COMPANY.

(Stand 3.)

The above company's exhibit will consist of road-making materials—such as pitch, tar and oils—and they are making a special feature of a new manufacture of theirs—viz., Pitchphalte—which they describe as an excellent material for road grouting, &c. They claim that this article has all the good properties of bitumen, combining great durability with freedom from stickiness under sun heat. It has, they add, the additional advantage that it can be supplied at less than half the cost of bitumen.

WM. WEEKS & SON, LIMITED.

(Stands 96 & 97.)

The exhibits of the firm of Wm. Weekes & Son, Limited, Perseverance Iron Works, Maidstone, will be as follow:—

(1) Patent horse-drawn tar-painting machine, No. 1 P, of 230 gallons capacity, to cover working width of 7 ft.

(2) Hand-power tar-spraying machine, No. 2 H, of 250 gallons capacity, complete with spraying

WEEKS HAND-POWER TAR-SPRAYING MACHINE.

pump, fitted with air scavenging arrangement, crane and pulley blocks for lifting barrel on to boiler.

(3) Hand-power tar-spraying machine, No. 4 H, of 80 gallons capacity, fitted with spraying apparatus and filling pump.

WEEKS PATENT HORSE-DRAWN TAR-PAINTING MACHINE.

(4) Small independent hand-power tar-spraying [illegible] of 35 gallons capacity.

(5) Small portable tar boiler and sand dryer for repairing broken patches in roads.

(6) Direction post with three arms, having raised letters on cast-iron plates (prize winner at 1914 International Road Congress).

H. C. SLINGSBY.

(Stands 79 & 80.)

Patent trucks and ladders of all kinds will be exhibited by the well-known firm of H. C. Slingsby, 142, 144 and 146 Old-street, E.C. This business comprises twelve complete lines—viz.: (1) Slingsby's sliding-wheel patent trucks, known, used and endorsed in all civilised countries; (2) sack trucks, patent "Collron"; (3) handcarts of every description; (4) portable railway material; (5) carrier tricycles; (6) wheelbarrows of all kinds; (7) milk carriages; (8) platform trucks; (9) castors, roller and ball bearing; (10) Slingsby steelback patent extension ladders; (11) Slingsby steelheld extension step-[illegible] (12) [illegible] and [illegible] of any design.

EMBOROUGH STONE COMPANY, LIMITED.

(Stand 23.)

Bituminous macadam for surfacing roadways, bituminous patching for repairing potholes and ruts, and tar paving for footpaths will be brought to the notice of visitors to the Exhibition by the Emborough Stone Company, Limited, Emborough, near Bath.

ENDERBY AND STONEY STANTON GRANITE COMPANY, LIMITED.

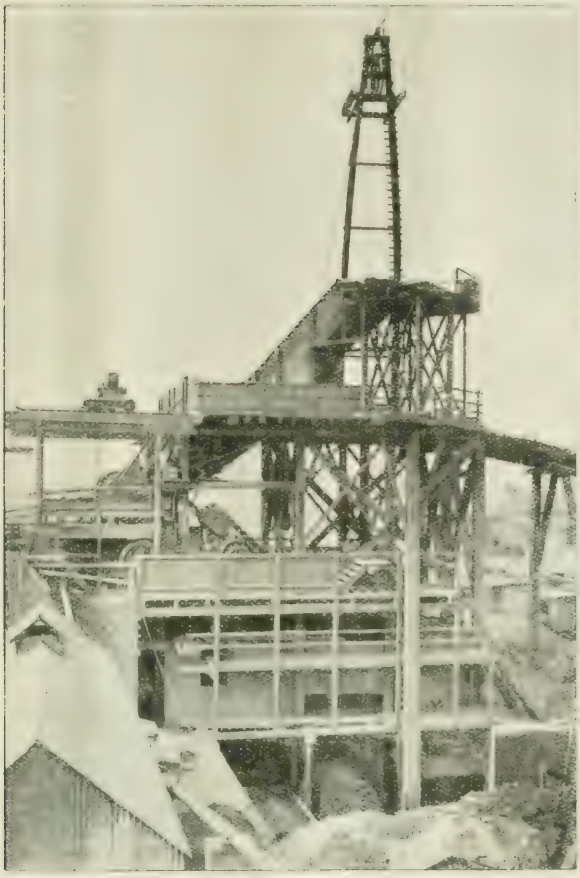
(Stands 36 & 41.)

The Enderby and Stoney Stanton Granite Company, Limited, of Enderby, near Leicester, have set out on Stands 36 and 41 a few of their productions, which help to convey to the observer the varied kinds of stonework they supply. The company work the following quarries in Leicestershire: Sapcote, Granitethorpe, Stoney Stanton, Earl Shilton, Huncote, Narborough, Redhill, Enderby Mill and Enderby Hill; also two in North Wales.

Other exhibits include all kinds of granite setts for tramway work, crossings and general paving the various kinds of broken granite for road making, granite chippings, and screenings for footpaths, concreting work, &c., kerbs and channelling of all sizes, and many other productions too numerous to mention.

They are also licensed producers for the Durax Dustless Roads, Limited, whose widely adopted system of paving for roads subjected to the more intense forms of traffic is the subject of an article which appears on a later page of this supplement.

Before concluding, special attention should be called to the productions of tarred macadam and chippings of different sizes.



Crushing Granite for Macadam. Enderby Quarries.

View of Earl Shilton Quarry.

FERROMAC.

(Stand 18.)

Stand 18 is in the occupation of Mr. R. A. Fraser, Broadway-court, Westminster, S.W., to whom visitors to the exhibition are directed for information regarding Ferromac roads.

Ferromac is a cementitious binder for superseding water-bound macadam roads. It has been used in England and abroad for about seven years, and it is claimed that Ferromac roads have the following advantages over ordinary water-bound: That internal attrition is entirely prevented, the dust nuisance is greatly minimised, the roads are absolutely clean and waterproof, the life of the road is prolonged from 50 per cent to 60 per cent, the surface is non-slippery, and the cost of cleaning and maintenance is much reduced, while the chemical properties of Ferromac do not injure either fish or plant life.

Miles of Ferromac have been laid in the counties of Lincolnshire (Kesteven Division), Huntingdonshire, Bedfordshire, Worcestershire and Wiltshire, and the roads have been most successful, particularly the Fen roads laid in Lincolnshire and Huntingdonshire.

Ferromac roads are also laid with a bitumen surface when the road has to carry extraordinarily heavy traffic, and considerable lengths have been laid at Leyton in Essex, and in Guernsey.

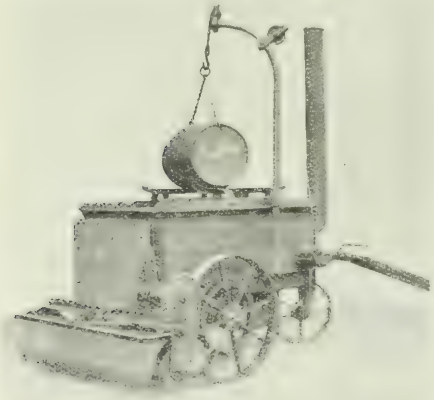
R. S. CLARE & CO., LIMITED.

(Stand 27.)

At this time of financial stringency, which has made itself felt in every branch of commerce and municipal undertaking, the curtailment of expenditure has naturally proved essential, and it speaks well for the sheer merit of the articles that Messrs. R. S. Clare & Co., Limited, of Stanhope-street, Liverpool, supply that an enormous increase of business should have been experienced by this well-known road treatment firm, in spite of the adverse conditions referred to.

It is now, of course, an axiom that materials, of whatsoever nature, which may be destined for use in connection with our military operations in Europe should be of the finest quality procurable, and the War Office have evidently recognised this when ordering, as they have done, a quantity of Tarco for use in France.

One of the results of the national crisis through which we are at present passing is that much of the work which is being done on roads throughout the country this season should take the form of treatment of existing surfaces rather than actual con-



CLARE & CO.'S TAR-SPRAYER.

struction, and this has resulted in a tremendous impetus to the sales of Messrs. Clare's Tarco, the efficiency of which is so well known. A large amount of patching is also being done, and for this class of work Bi-Tarco is a favourite medium, and, on the basis of results obtained, deservedly so.

For the construction of improved tar-macadam, Bi-Tarco, containing as it does a large proportion of pure bitumen and other agglomerating substances, is still the standard binder, and its wonderfully adhesive qualities make it an ideal material in conjunction with granite and similar hard stone.

For those who prefer the grouting method of road construction, a special grade of Bi-Tarco is supplied, and this has yielded exceedingly successful results.

In addition to these road compositions, Messrs. R. S. Clare & Co. are well known in connection with the supply of tar-spraying machinery. The accompanying illustration shows the type of appliance with which this firm have made such a success. The principle governing the working of this is briefly as follows: The hot liquid falls by gravity into a perforated pipe which runs it on to a rotary distributor. The rota is built up of discs and six vanes which revolve at a fair speed, the vanes striking the tar jets as the material is discharged through the perforated pipe, spreading it on the road and giving a perfect distribution.

The advantages that this machine possesses are too numerous to mention in full, but we think the fact that it is foolproof and has no pumps and nozzles or other intricate parts to get out of order will prove a strong recommendation to all users of spraying machines.

These appliances can be supplied in practically any capacity between a small 50-gallon size, to be drawn by hand, which is specially suitable for footpath work, and 1,000-gallon size, to be drawn by tractor; between 160 and 300 gallons capacity these machines are horse-drawn.

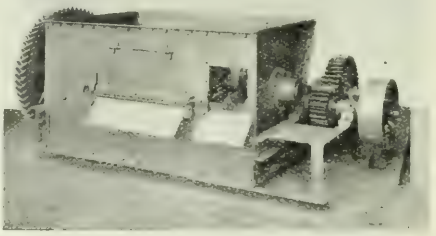
Messrs. R. S. Clare & Co. also supply tar-macadam mixers, of which the adjoining is an illustration. As a matter of fact, this shows an earlier type than the one which is now being supplied, and the present standard model has been improved in respect to the gears, which are now arranged at one end of the plant, the resultant advantages being obvious.

This mixer is essentially one for hard wear, being sound and exceptionally strong; as a matter of fact it weighs between 35 and 40 cwt. It is capable of mixing ½ or 1 ton batches, and its average output may be reckoned at a conservative figure as 50 tons per day, which, however, can be greatly increased, provided conditions of labour and materials are suitable. The shell is built up of mild steel angle plates, channel, &c., with cast-iron curved bottom of specially hardened material made in segments ¾ in. thick. The first drive is of double helical gears 3 in. wide, and the second runs on a 2½-in. mild steel shaft with spur gear and pinion 4½ in. wide. A pulley or chain wheel can be supplied for driving, as preferred. The arms are made of strong cast-iron, with renewable steel blades.

When used for batch mixing the material is fed in at the top, and then mixed, after which the large door at the back is opened, when the machine will then discharge the mixed material into a barrow or cart.

For continuous mixing the material is fed in at the top, at the end farthest from the small door, which is left open; the mixer will then carry the material along and discharge it, when mixed, in a continuous stream through the small door.

Messrs. R. S. Clare & Co., who were the pioneers of road treatment compositions, have not only kept abreast of the competition that has arisen since



CLARE & CO.'S TAR-MACADAM MIXER.

their initial achievements, but have outdistanced many competitors, and are now well in the forefront of this class of business.

We are informed that, owing to the large number of Messrs. Clare's staff who have joined the Forces, and the great pressure of business under which they are working, it has been found impossible to give the necessary time and attention to preparing a series of exhibits such as has always been an interesting feature of this firm's previous appearances at these exhibitions; they have, however, asked us to state that they have reserved an office (No. 27), where their representatives will be very pleased to receive their numerous friends who will be visiting the Exhibition.

CLARMAC ROADS, LIMITED.

(Stand 35.)

Clarmac Roads, Limited, Hallam House, 3 Central-buildings, Westminster, are showing their Clarmac tar slag macadam, also dry slag for concrete or road bottoming, slag chippings for tar-spraying, samples of Clarphalte asphalt carpeting, and raw materials, &c. We are informed by the company that they are supplying Clarmac for the construction of Lordswood-road, Birmingham, St. George's Park-avenue, South-end-on-Sea, and that it is also being supplied for High-street, Coventry, Hearsall-lane, Coventry, several roads in Beckenham, Aldershot, and elsewhere. The company are also at the moment laying Station-road, Aldershot, in Clarphalte.

HILL'S PATENT MOTOR VACUUM ROAD CLEANSER, LIMITED.

(Stand 24 & 25.)

The exhibit of the above firm, which is to be erected on 4 Broad Streetplace, E.C., will be of special interest to municipal engineering visitors to the International Hall. It takes the form of their latest motor cleansing demonstration, of which orders are in hand, have been given, for many towns in London, Manchester, Glasgow, and other districts. The machine consists of four main components, a complete Dingo model chassis, 25 h.p. petrol engine and chain driven, with a capacity of, approximately, 3 tons, placed behind the cab for collecting the sweepings, and a water tank, together with pump and jets for spraying atomised water to the road surface in front of the brush.

The engine develops 45-h.p., and has three speeds forward and one reverse, with direct drive on top gear. The cylindrical revolving brush, the speed of which remains constant, is built up of twenty distinct brushes arranged along the plane of generator surfaces, and can be expanded or contracted, thus regulating the pressure on the road surface or adjusting for wear; this apparatus enables nearly the whole of the bristles to be worn away. The brush, 4 ft. in diameter, sweeps a track 7 ft wide, and, revolving at great speed and in a contrary direction to the road wheels, raises the sweepings and passes them into the receiver behind. The brush can be put out of action or started for working instantly from the driver's seat, and is effectually enclosed on to the road by means of a flexible leather screen.

The water tank is of 100 gallons capacity, and its contents are sprayed by means of a pump and atomising jets to the road directly in front of the brush, and all dust is prevented from rising. The addition of a soluble disinfectant to the water disinfects the road, while the refuse collected can be dealt with in a more hygienic form.

The following are the advantages claimed for the machine: (1) Sweeps and collects from 7-ft. track at one operation; (2) cleanses perfectly every class of road without damage to surface; (3) works close up to the kerb; (4) effects enormous saving in cleansing expenses; (5) work executed under perfect hygienic conditions; (6) working among the traffic the machine can be used day or night without the slightest inconvenience to the public.

STEREOPHAGUS PUMP AND ENGINEERING COMPANY, LIMITED.

(Stand 90.)

The principal item on the stand occupied by the Stereophagus Pump and Engineering Company, Ltd., 39 Victoria-street, S.W., will be a 1½-in. stereophagus pump and electric motor in action. The pump is specially designed for dealing with liquid containing large quantities of solid and fibrous matter without previous screening. Its essential features are that there are no obstructions in the passages traversed by the liquids by which such matters can be arrested, and the working vanes of the impeller are continually scraped by a blade which pushes off or cuts up any matter lodging on their edges.

The pump also contains provision for the taking up of wear, without the renewal of any parts, so as to maintain the original efficiency unimpaired.

The pump is in extensive use for town drainage, sludge pumping and similar duties.

JAMES WM. GLOVER & SONS.

(Stand 98.)

Messrs. Glover & Sons, Warwick, are exhibiting their patent Warwick sprinkler, of which they are the original inventors and sole manufacturers. This van is made to the order of the Hampstead Borough Council, who have large numbers in use. Several improvements have recently been made in the construction of the valve and outlet from tank.

WILLIAM HAYWARD & SONS, LIMITED.

(Stand 66.)

The exhibit of Messrs. William Hayward & Sons, Limited, Brunswick Works and Vulcan Works, Wolverhampton, comprise samples of unclimbable railing, round and square uprights, unclimbable self-adjusting railing, round and square uprights, villa, garden and carriage gates, ornamental wrought-iron entrance gates, and ornamental railing for parks, public buildings and schools.

A. C. WELLS & CO.

(Stands 20 & 25.)

The exhibits of Messrs. A. C. Wells and Co., 102-104 Midland-road, St. Pancras, N.W., will include examples of their road heaters and portable tar boiler —illustrated herewith. For quickly heating tar,

Wells' Portable Tar Boiler

pitch, bitumen, or other mixture in a convenient manner, and without the trouble of a separate tar cart, the portable boiler should be invaluable, since it can be put into a cart with the other tools. The tar is heated by means of a Wells' flare lamp, which

Wells' Road Dryer

is easily removable and can be used separately for lighting if required. The road heating machine is very simple, strong and efficient, and has already been adopted by numerous authorities.

BRITISH REINFORCED CONCRETE ENGINEERING COMPANY, LIMITED.

(Stand 1.)

Among the public authorities which have recently made use of the B.R.C. road facric in road foundations are the county councils of Essex and Antrim, the corporations of Manchester, Leicester, Lincoln, Dublin and Hornsey, the metropolitan boroughs of Bethnal Green and Lewisham, and the urban district councils of Erith, Ilford, Tilbury, Wanstead and Woodford, and a large area of reinforced-concrete roads is under construction for the War Office. The B.R.C. fabric, a sample of which is on view at the company's stand (No. 3), is a mesh of drawn-steel wire, electrically welded at all points where the wires cross one another. It is made in rolls about 7 ft. wide and 240 ft. long, and is easy to handle and simple to instal. A sample of the foundation is also shown, together with photographs of work in progress and work completed in various parts of the country.

Concrete reinforced with B.R.C. fabric is, the company claim, a foundation strong, "live," and resilient, and at the same time economical. The fabric is designed to be easily and rapidly laid in the concrete without special appliances or special supervision, and it so increases the strength of the concrete that a comparatively small thickness is required even for the heaviest traffic. A B.R.C. fabric reinforced foundation spreads each wheel-load over a large area of underbed, and provides even in a new road conditions equal to those that exist in the consolidated foundations of the best and oldest roads. Every type of surface lasts longer, and costs less to maintain on a B.R.C. fabric foundation. The company's offices are at 82 Victoria-street, Westminster.

JAMES OAKES & CO.

(Stand 73.)

Examples of the productions from their iron and tar-macadam and sanitary pipe, glazed brick and tile departments will be shown by Messrs. James Oakes & Co., Alfreton, Derbyshire.

ANGLO-MEXICAN PETROLEUM PRODUCTS COMPANY, LIMITED.

(Stands 43, 44 & 45.)

Prominent among exhibits of road materials at the Horticultural Hall is that of the Anglo-Mexican Petroleum Products Company, Limited, of Finsbury-court, London, E.C., who are showing their well-known Mexican bitumens, Mexphalte and Fluxphalte.

Mexphalte is a high-grade bitumen, 100 per cent pure, of great toughness and extreme ductility. It is specially refined from vast natural supplies in Mexico. It has exceptional cementing qualities, as is demonstrated both by laboratory tests and practical service in roads all over the country. Its value for grouting work and for asphalt-macadam is established, and it is being used with all the leading types of mixing plant. Roads constructed with Mexphalte are claimed to be dustless, silent and sanitary, as well as waterproof and wear-resisting under the heaviest traffic.

Fluxphalte is a more liquid bitumen containing 60 per cent solid, specially refined for spraying roads. The dressing is applied hot by a pressure-spraying machine, and is an easy and effective method of giving a dustless asphaltic surface to an ordinary macadam road. It may be mentioned that there is no tar or by-product of tar in Fluxphalte.

These materials are now so well known to surveyors that little more needs to be said about them beyond remarking that the company is maintaining the uniform high-grade character of these products, and the work of the past season has still further demonstrated their suitability for road work in this country.

The exhibit comprises specimens and samples of Mexphalte and Fluxphalte reinforced by an excellent series of photographs showing their application both in this country and abroad. Among the literature being distributed is the third edition of the company's attractive booklet, "Twentieth Century Roads," which is a record of the constant progress made in the use of the above materials in all parts of the kingdom.

LOCH FYNE GRANITE QUARRIES, LIMITED.

(Stand 12.)

The exhibit of this firm consists of three nidged setts, 6 in. by 6 in. to 11 in.; two nidged setts, 4 in. by 6 in.; two ordinary setts, 4 in. by 6 in.; two ordinary setts, 3½ in. by 6 in.; two ordinary setts, 4 in. by 7 in.; two pegtops, 4 in. by 4 in. by 6 in.; two cubes, 4 in. by 4 in. by 4 in.; and ½ cwt. macadam and chippings, ½ in. by ¾ in.

Special attention may be drawn to the company's nidged sett paving exhibit, as this paving is devised to suit the most exacting requirements of modern traffic, and has the combined advantages of being as noiseless as wood paving, more durable, cheaper, and is non-slippery, which is essential for a successful city paving.

Their macadam, as exhibited, is perfectly screened, cubicle, and, the firm claim, stands the highest crushing strain of all Scotch granites, as per Messrs. Kirkaldy's test, showing a resisting strain of 44,661 lb. to the square inch.

Their granite chippings exhibited, ½-in. and ¾-in. sizes, are specially screened, and have been highly recommended for all grouting, tar-spraying, ferro and reinforced concrete work, being absolutely free from dust and all foreign matter. The firm are confident that this material will give satisfaction in any market, as their Grarae plant has been extended for this purpose by the introduction of Hadfield's latest type of disc crushers.

"KYL-FYRE," LIMITED.

(Stand 24.)

"Kyl-Fyre," Limited, 12 Elms-buildings, Eastbourne, have a display of their extinguishers, of which over 1,500,000 are stated to be now in use. "Kyl-Fyre" is a dry powder, and is contained in a cylindrical tube, 20 in. long by 2¾ in. diameter, and weighs 6 lb. At the top of the tube is attached a strong loop from which it is suspended by a strong hook. In case of an outbreak of fire a person merely takes a firm grip of the tube and pulls down (thus leaving cap on hook), and throws the contents with force into the base of the flames. The result is instant extinction of the flames. When the powder strikes heat it immediately generates a powerful, but harmless, gas, which, by displacing the oxygen in the air, must extinguish the flames. The hotter the outbreak the greater the effect. It contains no grit and no acids.

TARMAC, LIMITED.

(Stands 8, 9 & 10.)

The exhibit of Tarmac, Limited, Ettingshall, Wolverhampton, and 20 Victoria-street, Westminster, will include samples of the specially selected blast furnace slag—lump and broken—from which their widely-used material is made, and samples of Tarmac as prepared ready for laying; photographs of the company's Wolverhampton works, of the trial sections of Tarmac laid in connection with the Road Board trials at Sidcup and Wandsworth, and of Tarmac roads in Gloucestershire, Warwickshire, Lancashire, Nottinghamshire, Worcester, Berkshire, and elsewhere. In some notes on their material the company say: "The suitability of blast furnace slag of the right sort for the manufacture of tar-macadam has been amply proved under actual test. Examination of our samples of untreated slag will demonstrate that the slag used by the company has an exceptionally rough and uneven surface, which means that it possesses the maximum 'holding power' for the mixture used for coating. It is porous enough to perfectly retain and hold the mixture, and is at the same time as strong as the best classes of granite and similar materials."

The company have a fully equipped tar-distillation plant at their works, and the tar compound used for coating is distilled and prepared to physical and chemical standards known to give the best results as regards strength of binding properties, freedom from tendency to affectation by atmospheric variations, and length of life as an effective bind.

Tarmac is made in three gauges—2½-in. (2½ in. down to 1½ in.), 1½-in. (1½ in. down to ¼ in.), ⅜-in. (⅜ in. down to ⅛ in.)—and is recommended for the construction of dustless, mudless and durable roads and carriageways, footpaths, carriage-drives and school playgrounds.

Large extensions to both the company's existing works have been recently completed, but such is the demand that they have proved inadequate. New works are now in course of erection at Brymbo, near Wrexham, and at Middlesbrough.

ROBEY & CO., LIMITED.

(Stand 62.)

This well-known Lincoln firm had intended making a large display of their road rollers, road locomotives, &c., but, owing to the extensive demands made by the Government on their manufacturing facilities for the production of munitions, it was found impossible to complete their exhibit.

They therefore show one of their new design 5-ton steam wagons, which is meeting with an increased demand. Many advantages are claimed for this wagon, chief among which is the Belpaire type of boiler, in which, owing to the absence of roof bars, circulation of water is not impeded, which tends towards economy,

5-ton "Robey" Steam Wagon.

and gives greater accessibility for cleaning. A greater heating surface is obtained, due to the larger tube plate, and a large steam space is secured without curtailing the depth of water on firebox top. The engine is of the compound overtype pattern, cylinders being bolted to steel seatings riveted to boiler. Superheated steam is used, and a feed water heater is provided, giving economy in fuel and water consumption.

A compound tractor is also exhibited. This is built on precisely the same lines as their well-known road locomotives, and comes within the allowable limit of weight. It is fitted with specially large cylinders, and patent spring gear adjustment to hind axle. These engines are readily convertible to rollers, and a number have been supplied to urban district councils.

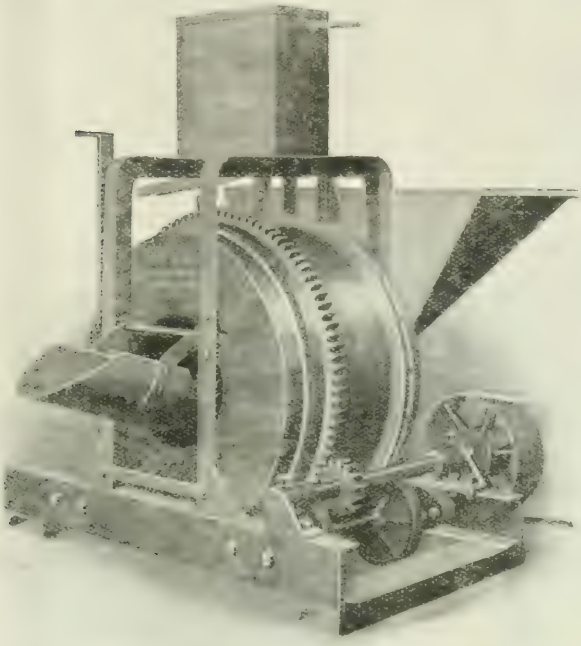
Messrs. Robey & Co. are also manufacturers of stone-crushing plants, portable engines, &c.

RANSOME-VERMEHR MACHINERY COMPANY, LIMITED.

(Stands 68 & 92.)

The main feature of this exhibit is a concrete mixer known as the "I.M.P." machine, which has been designed by the company to meet the requirements of engineers and contractors carrying out small work, where initial outlay on a mixer is an important item.

The machine exhibited is of the No. 0 size, having an approximate batch capacity of 5 cub. ft. of mixed concrete, the average output being 60 cub. yds. per day of ten hours, and the maximum output 120 cub. yds. per day of ten hours.



"I.M.P." CONCRETE MIXER.

The mixer is fitted with a feed chute, adjustable water tank, and fast and loose pulleys. It is of very strong construction throughout, and is, of course, backed by the "Ransome" guarantee. The price will be found to compare favourably with any other concrete mixer of sound make at present on the British market. The machine is manufactured by Messrs. Ransomes & Rapier, Limited, of Ipswich, and prompt deliveries can be given.

The company are also exhibiting several lengths of their Ransome Type D steel piling, cut from actual piles. Illustrated herewith is a series of cofferdams constructed of this section, which will eventually extend over a length of 1¼ miles. The particular cofferdams illustrated were used by the contractors for laying an outfall sewer for the Belfast Corporation.

The Ransome section has also been employed in very large quantities on the Port of London extensions, the Rosyth naval base, Kingston Bridge widening, &c.

Particular attention is drawn to the trough shape of the section, which gives it maximum strength with minimum weight, and also the oval surface of the interlock, which obviates any possibility of jamming, and allows the section to be withdrawn and re-used many times. When in position the piling is perfectly watertight, without any necessity for caulking or the use of clay puddle.

Although the company are not, on this occasion, exhibiting their stone dryers and tar-macadam mixers, water filters, or pile extractors, it may be of some interest to indicate that the first-mentioned have been adopted by many leading surveyors in the country, including Mr. A. Dryland, the county surveyor of Surrey; Mr. J. A. Crowther, the borough surveyor of Southampton; Mr. J. E. Swindlehurst, the city engineer of Coventry; the Southport Corporation; the Devonport Corporation; and such well-known private firms as the Limmer Asphalte Paving Company, Ltd., and Claridge's Patent Asphalte Company, Ltd.

An installation of water filters is at the present moment being completed for the Merthyr Tydfil Corporation to treat 1,200,000 gallons per day of twenty-four hours, and the company are also executing an extremely large contract for the Toronto Corporation, the quantity of water to be treated being 60,000,000 gals. per day. The pile extractors have been largely employed for withdrawing steel, timber, and reinforced-concrete piles, and among users may be mentioned the Clyde Navigation; the North-Eastern Railway; the Taff Vale Railway; Messrs. S. Pearson & Son, Ltd.; Topham, Jones & Railton, Ltd.; Easton, Gibb & Son, Ltd.; Perry & Co. (Bow), Ltd.; Dick, Kerr & Co., Ltd.; Holloway Bros. (London), Limited, and Jackaman & Son.

JOHNSTON BROTHERS.

(Stands 106 & 107.

In addition to their patent double-furnace tar-boilers, Smart's Midget tar-boiler and appliances for road patching, Waithman's reservoir tar-brooms, road signs, tar-trollies, Archer's brooms and tar-brushes, Messrs. Johnston Brothers, 79 Mark-lane, E.C., are

COFFERDAMS CONSTRUCTED WITH RANSOME TYPE D STEEL PILING.

exhibiting various road materials—quartzite, granites, tar-macadam and slag.

TRINIDAD LAKE ASPHALT PAVING COMPANY, LIMITED.

(Stands 15 & 30.)

Samples of Trinidad Lake asphalt, both in its raw state and after being submitted to the process of rolling, will be among the exhibits of the Trinidad Lake Asphalt Paving Company, Limited, Britannia Wharf, Townmead-road, Fulham, S.W. The firm's asphalt pavements are now to be found in all parts of the country. One of the chief features of the process is the elimination of a Portland cement concrete foundation, usually associated with asphalt pavements. Samples are shown of the composition as laid in various thicknesses. The following are the specifications in most frequent use: (1) For roadways of light traffic, 1½ in. to 2 in. Trinidad asphalt macadam is laid upon the existing macadam roadway; (2) for roadways of medium traffic, 2½ in. to 3 in. of Trinidad asphalt macadam is laid upon the existing macadam, or if there is not room for the new pavement without excavating, the surplus material is removed, and, after the base has been formed to required levels, and consolidated with a heavy roller, the new pavement is laid to the thickness specified; (3) for roadways carrying motor-'bus and similar heavy traffic, 3in. asphaltic concrete and 1½ in. Trinidad Lake asphalt wearing surface (this is the specification adopted upon the Victoria Embankment); the foundation of the roadway is prepared as described under specification 2, and the new pavement, consisting of 3 in. of asphaltic concrete and 1½ in. Trinidad Lake asphalt wearing surface, is put down in two layers. The firm's exhibits will include special machinery for drying, heating, grading and mixing coarse and fine aggregate with bitumen in road construction work. Photographs will illustrate roadways laid with Trinidad Lake asphalt in various parts of the United Kingdom, and of the paving plant used for the manufacture of the material. Another feature of the display will be the firm's mastic asphalt for roofs, floors and dampcourses.

PRUFIT.

(Stand 69.)

Messrs. Rogers, Welch & Co., Limited, of 26 Page-street, Westminster, are showing some exhibits of cement work waterproofed with Prufit.

This enterprising firm stepped in at the outbreak of war last August, and procured a licence from H.M. Board of Trade to use the patent under which Ceresit was made. They are calling their manufacture Prufit.

Messrs. Rogers, Welch & Co., Limited, claim that Prufit has merits which no other waterproofers possess. These merits may be summed up as simplicity, safety in use, and economy in cost. People who used Ceresit in the past will need no convincing of this, and others should make a point of calling at the stand and examining the claims of this waterproofer for themselves.

Messrs. Rogers, Welch & Co. have made arrangements for marketing Prufit, not only in all British Dominions, but in various foreign countries. We wish this laudable endeavour to capture German trade for British industry every success.

GENERAL VEHICLE COMPANY, LIMITED.

(Stands 108 & 109.)

The General Vehicle Company, Limited, Imperial House, Kingsway, will exhibit one of their 3½-ton chassis, which, it may be added, will be fitted with a Warwick street watering sprinkling arrangement. The battery fitted has a 268-ampere-hour capacity. The firm have sold a similar vehicle to the one to be exhibited to the Ipswich Corporation, the vehicle being equipped to take an interchangeable dust-collecting tipping body and street-watering tank.

MIDDLESBROUGH SLAG COMPANY, LIMITED.

(Stand 38.)

Samples of blast furnace slag and tar-macadam comprise the exhibits of the Middlesbrough Slag Company, Limited, Tees Bridge Slag Works, Stockton-on-Tees.

MERRYWEATHER & SONS, LIMITED.

(Stand 105.)

The famous Greenwich firm will be showing their vacuum apparatus for emptying cesspools and gully-holes, a vacuum cylinder van of 350-gallons capacity, and a portable petrol vacuum pump, among other things.

CROSS & CROSS, LIMITED.

(Stand 86.)

At Stand 86 Messrs. Cross & Cross, Limited, Union Works, Walsall, exhibit various types of motor warning and speed limit signals, either for fixing direct in the ground or to any convenient wall. The warning plates are of malleable iron and are unbreakable as may be seen from a bent sample exhibited—and the hollow triangles are cut from the solid mild steel plate.

The warning notice, "Road under repair," illustrated herewith, is of steel throughout, the plate being

enamelled with 4-in. white letters on a red ground. These can be supplied with any other inscription that may be found necessary.

The firm also exhibit samples of malleable-iron letters for fixing to existing wooden direction-posts in place of the usual painting. These have the great advantage of being permanently legible. Messrs. Cross & Cross are also makers of steel-framed buildings, roof trusses, and constructional steelwork for all purposes.

ROCMAC, LIMITED.

(Stands 19 & 26.)

The firm of Rocmac, Limited, 13 Victoria-street, S.W., are in occupation of Stands 19 and 26. Rocmac is a waterproof binder for macadam which has admittedly stood the test of time.

Among the claims made for it are that it can be laid in any weather, that it affords a good foothold to horses in any weather or on any gradient, and that it binds granite as well as tar or bituminous binders bind softer or more porous materials.

The firm state that it is unaffected by weather or any climatic changes. The Rocmac binder is a silico-saccharate-carbonate, and is formed by the combination of Rocmac solution with carbonate of lime. First cost is not excessive, as a general rule, Rocmac costs in Great Britain 20 to 40 per cent more than a water-bound macadam road laid with the same aggregate. Finally, to quote the makers, "Rocmac at least doubles or trebles the life of the aggregate bound with it. Rocmac can be repaired as easily as a water-bound road, and its cost in maintenance is very low. Rocmac roads have been laid by hundreds of local authorities in Great Britain."

ELECTRIC HOSE AND RUBBER COMPANY, LIMITED.

(Stand 89.)

The above firm, who carry on business at Caxton House, Westminster, are specialists in the manufacture for garden, industrial and mechanical purposes, and have arranged a comprehensive display of their productions. Municipal engineers will, perhaps, be more particularly interested in their heavy delivery suction, steam and pneumatic hose. They will also be showing their "R.F.C." rubber-filled and covered belting.

BRISTOWE & CO., LIMITED.

(Stand 42.)

Messrs. Bristowe & Co., Limited, 11 Tothill-street, Westminster, are showing, at Stand 42, Tarvia in its varying grades—A grade for Tarviated macadam and constructional work, B grade for surface treatment, Grout grade and Tarvia pitch for grouting Durax paving or other similar work. Samples of Tarviated granite of varying grades and gauges will also be exhibited, and an object of especial interest will be a section of road laid for the Penge Urban District Council in 1913.

As is well known, the Cantar hand-spraying machine is a specialty of the firm. The type illustrated [illegible] with a horse-drawn (No. 2) machine, [illegible] of 160 gallons, and is capable of supplying [illegible] Tarvia or tar compound, heated to a temperature of 200 deg. Fahr., to spray 5,000 super. yds. of road surface per day, provided the fire has proper attention. The spraying apparatus is likewise adapted to deal with this quantity in an ordinary working day, and is fitted with pump, filter, thermometer, pressure gauge (to ensure the same quantity being applied throughout), hose carrier, 16 ft. of flexible hose, in [illegible]

No. 2 Cantar Hand-spraying Machine

with four jets. The apparatus is designed to enable the Tarvia or tar compound to be drawn from the boiler past the thermometer, and returned; this enables the exact temperature to be taken before commencing work. A hot-air supply is also fixed to the pump to ensure the whole of the tubes and vessels being well heated before allowing the tar to pass through them, and also to enable the whole fittings being well cleaned and blown out after working. The machine is fitted with a strong hoisting jib, complete with sling block and chain, for putting barrels in position.

The firm also manufacture a hand-drawn machine (No. 1), with a capacity of 75 gallons, this having fittings similar to the horse-drawn apparatus, with the exception of the hoisting jib. This machine is recommended for pathwork and small repairs, as its construction permits of its being easily moved about.

Fibrastic tramway rail and engine bed packing, and non-set plastic cement, are exhibited at the same stand by Messrs. Robbins & Co., 11 Tothill-street, Westminster. The Fibrastic packing has been successfully tried on a large number of tramway systems in different parts of the United Kingdom. It is claimed to be entirely waterproof, and immovable under traffic. Various sections and photographs illustrating work done are shown. Robbins' non-set plastic cement is a well-known medium for sealing cable boxes, manhole covers, and so forth.

IRONITE COMPANY, LIMITED.

(Stand 13.)

At Stand 13 the Ironite Company, Limited, of 1 Victoria-street, S.W., have arranged various interesting exhibits of building materials waterproofed with Ironite, also samples of their patent flooring process.

Ironite is a fine mineral powder which, simply mixed with water, enters into the voids of concrete, brickwork, woodwork, and other similar porous substances, and by oxidation and expansion forms, it is claimed, both a mechanical and chemical union, and becomes an inseparable part and parcel of same. In this process a substance is formed that is practically indestructible and impervious to water, air, heat, colds, oils, acids, alkalies, &c.

Ironite is applied either to a wet or dry surface and to a structure in course of erection, or to one many years old. It can be applied either internally or externally, and against any degree of water pressure. It is entirely free from any oil, paraffin, bitumen or similar substance, and permanently renders dampproof or waterproof any cellars, vaults, tunnels, basements, walls, reservoirs, baths, pits, roofs, [illegible] claimed to make a perfect dampcourse, and forms an ideal bond for cracks and leaks in brickwork and cement.

Ironite flooring is designed to be mixed dry with cement and crushed granite, or sand for the floor topping. In the process of setting, by reason of the chemical action which takes place, the particles of Ironite flooring not only expand and tightly seal the pores and interstices, but also bond the surrounding particles in a much firmer adhesion than is ordinarily obtained with Portland cement alone. This manner of topping produces a floor that, in addition to being absolutely impenetrable and non-absorbent, is as near to being wearproof as it is possible to make it. Such a floor, the company contend, will resist almost any crush-power and tensile strain.

METAL JOINTING COMPANY, LIMITED.

(Stand 70.)

The exhibit of the Metal Jointing Company, Limited, 11 Adam-street, Strand, W.C., will comprise various specimens of the Amalgaline system of jointing lead, as applied to general plumbing work (water services and sanitary pipes). The firm have also included samples of lead-lined iron pipes for sanitary work, which form the subject of a patent recently granted them, and which supplies a demand which, up to the outbreak of the war, was, the company state, entirely in the hands of the Germans. Further, they will show the best method of dealing with copper-lined lead pipes for hot-water work.

THE LIMMER ASPHALTE PAVING COMPANY, LIMITED.

(Stand 39.)

Prominent among the exhibitors are the Limmer Asphalte Paving Company, Limited, of Caxton House, Westminster, S.W., who have arranged an interesting display of specimens of mineral rock asphalte as taken from the company's freehold mines, Bassin de Seyssel (Haute Savoie), France, and mineral rock mastic asphalte (manufactured from the above mineral rock) and of the rock reduced to powder. Samples of refined Trinidad bitumen and Bridport grit, Lithofalt paving blocks in various thicknesses with plain and grooved surfaces, and Lithomac asphalt-macadam, suitable for county

From Photo by E. Melvoe, 81 The Grove, Wandsworth, S.W.

Lithomac Asphalt-macadam on Staines Road (Baber Bridge to Bedfont—2 Miles).

Lithomac Asphalt-macadam on Crystal Palace Parade.
(10,000 yds. super.)

roads and all carriageways bearing fast motor traffic [illegible] pavements of compressed asphalte paving as taken from the carriageway of Victoria-street, originally laid 2 in. thick, in 1897, compressed and relaid 2 in. thick, in 1900, taken from the carriageway of Holborn Viaduct, originally laid 2½ in. thick, in 1900, laid to falls, [illegible] and re-laid in Northumberland-street, Pop[illegible] in Victoria-street, 1908, and Limmer asphalt paving blocks, originally laid in Bow Common-lane, 2 in., in March, 1910. Samples of Bitumen bituminous specialities, including paints, varnishes and damp-proofing compositions are also exhibited, and there will also be exhibited photographs illustrative of work done in roofs, flooring, street paving, &c., and others showing the [illegible] of the Barnard de Segard.

Reproduced herewith are views of the Staines (main) road on which the firm's Lithomac asphaltic [illegible] and of the Crystal Palace Parade, where an [illegible] has been laid to the [illegible] Canberra. Briefly [illegible] the [illegible] material has been laid 4 in. in thickness on existing [illegible], to receive [illegible] and [illegible] 2½ in. thickness, and composed of 2-in. to ¾-in. stone (with a [illegible] and [illegible] [illegible] and [illegible] [illegible] and [illegible] [illegible] [illegible]

CONSTABLE, HART & CO., LIMITED.

Slag tar-macadam, as made under modern methods by the principal firms, is now recognised universally as an eminently suitable material for road surfacing. Among its many good points are its adaptability - being supplied for laying down ease of laying - although this should be done by expert layers—uniformly good results, economy in maintenance, low cost, cleanliness and durability compared with water-bound surfaces, and the good foothold it gives to horses.

Among the principal firms producing this material to-day are the well-known house of Constable, Hart & Co., Limited, of 41 Eastcheap, London, who have large works at Wellingborough, Islip and Wednesbury, a photograph of the last of which we are enabled to reproduce on this page. These works were only erected recently, at a large cost, to enable the firm to deal with the ever-increasing demand for their materials. At these Wednesbury works, which we had the pleasure of visiting some months ago, the firm have embodied all the latest improvements, resulting from their experiences at their older works, both in the manufacture and reduced cost of production.

Constable, Hart & Co.'s Slag Tar-macadam Works at Wednesbury.

Messrs. Constable, Hart & Co., although one of the oldest firms in the tarred stone trade at Matlock and elsewhere, only took up the manufacture of slag tar-macadam about ten years ago, since when they have produced material equivalent to over 3,000,000 sq. yds. of work, which has been laid on many important roads both in London and provincial towns, as well as on many of the principal county roads. One of the most important thoroughfares in London, Portland-place, Marylebone, with heavy traffic, was laid with this firm's material five years ago, and is now in perfect condition. They also laid two of the trial sections at Sidcup (9 and 10), and these are still in perfect condition. Innumerable other examples of the success of this firm's material could be given if space permitted, and we can strongly recommend surveyors and others to get into touch with them when contemplating the resurfacing of their roads.

A Glossary of Road Terms (By H. Percy Boulnois, M.Inst.C.E., St. Bride's Press, Limited, 24 Bride-lane, E.C., Price 2s. nett).—The movement towards standardising the principal roads throughout the United Kingdom has rendered it necessary to correlate the nomenclature of road terms in use in different districts, and Mr. Boulnois has compiled a glossary with the hope that it may form a basis for such a correlation.—*Times Engineering Supplement.*

ROAD MAINTENANCE DIFFICULTIES.

THE EFFICACY OF TAR TREATMENT.

In a special report on the work of tar-spraying the borough surveyor of Chippenham, Mr. A. H. Lapham, said he thought the council should honour the difficulties attending the work of road upkeep at the present time. In the first place the delivery of stone was stopped from several quarries unless it was required for military purposes, and, secondly, it was difficult to get hauling done, while at the same time labour was becoming scarcer. Up to the present he had made considerable progress with the tarring of the roads, and good results had been obtained. A tar sprinkler purchased by the council in 1913 was capable of treating upwards of a mile of road per day. Without the use of such a machine the tarring would last most of the summer, whereas now, with favourable weather—although commenced later than usual—the tarring of the roads in that district should be completed within three weeks.

There were many difficulties connected with the use of tar which the average person knew nothing about—such as weather conditions, the nature of the road, the quality of the tar, and the driers—all being important factors in the ultimate result. His conclusions, however, were that, apart from its value as a dust preventive and a healthful deodoriser, tar improved the surface of the road for all traffic, and was worth more than its cost as a material for road maintenance by reason of increasing the life of the road.

He had ventured to offer these remarks so that if the owner of a vehicle did pick up a few splashes of tar he might remember, when slight inconvenience was suffered on one journey, the many and permanent advantages which followed.

Waterproofing.—The following report from the engineer of one of our largest boroughs will be of interest. The heating chambers and underground coal-storing places of a school built about eight years ago were continually flooded—so much so that the boilers were destroyed. The engineer at first thought he would have to fill in the chambers because the water was made so rapidly, but decided, as a final resort, to make a new waterproofed concrete wall, and to give the wall a waterproofed cement rendering. The result was excellent. New boilers were put in, and the whole of the underground chambers are now dry. The work was done last September, and has stood the heavy rains of the past winter. The engineer states that he is now specifying Pudlo (the waterproofer used on the above work) for a heating chamber to a santorium.

BRISCOE'S PATENT MANHOLE COVER.

Practice with the times is shown at the introduction by a municipal engineer of an entirely new design in manhole-cover frames embracing principles which can be applied to any surface-pit cover frame, gully tops, and so forth.

There are quite a number of novelties attached to the design that may prove interesting to the municipal and county engineer and surveyor, who has continually to contend with the little irritating imperfections which are frequently found to accompany the use of such articles.

From a pamphlet before us entitled "A Word about Manhole and the like Surface-pit Cover Frames, by A. H. Hall, M. and C.E. and M.R.San.I. and Pub.," it would seem that the patentee has taken into consideration every known defect arising in the ordinary cover frames, and, determining their causes,

has avoided these, producing a cheap cover frame which, from an engineering point of view, should give perfect satisfaction.

The differences between this cover frame and others might be summarised as follows:—

(*a*) While other cover frames consist usually of a vertical wall or side with a bearing flange at or level with its lower edge, all bedded above the masonry of the surface pit or manhole, this new frame has a horizontal flange introduced between the lower edge and the top, which forms an additional bearing for the cover frame. The bed for this additional bearing reinforces the vertical wall or side of the frame. The introduced flange is so shaped that it not only provides the additional bearing for the cover frame, but it also reinforces the road surface abutting against the frame, so that there is always a cushion of road material against the frame, absolutely preventing the presentation of any sharp edges to the traffic, and affording a perfectly easy transmission of loads over the cover.

(*b*) The double seatings of the cover in the frame are treated in such a novel fashion that it would appear almost impossible for the cover to rock in its frame, as is so often the case with manhole covers. The lower seating is corrugated, so that, while there is a good bearing, no ledge is left on which stones or dirt may lodge, a common cause of covers rocking. The upper seating on the frame consists of a conical or knife edge, upon which the flat face of the upper bearing of the cover rests—a principle intended to ensure that the cover will be self-adjusting in its frame.

The bricklayers state that the cover is much more easily handled and fixed than the ordinary cover.

It is claimed that, while in as simple manner as possible attaining all the objects for which patent covers have been introduced in recent years, this cover frame is designed to do more, inasmuch as the necessary bed for the new position of the bearing flange protects and strengthens or reinforces the walls of the cover frame, and the design of the flange is such that it is at once self-evident that it marries and maintains the road material surrounding the frame to the frame, and so reinforces the road surface surrounding the frame.

A notable advantage which this cover frame appears to present is obtained by taking into consideration what doubtless hitherto custom has left to the workmen—that is, the fact that when a surface pit is constructed, the construction space behind the walls of the surface pit has to be filled in, which, if with ordinary filling, however thoroughly punned, will always be more or less subject to settlement. Such settlement naturally causes a depression at the surface of the roadway, and tends to drag the road material away from the manhole-cover frame, exposing the iron face of the walls of the cover frame to the oncoming traffic.

The new cover frame has dealt with this matter so that the depression at the surface of the roadway cannot take place against the cover frame, as is possible in all cases hitherto presented, but the possible depression is removed to a distance from it, always leaving a cushion of road material around the frame to protect it.

We quote from the pamphlet referred to respecting the new position of the flange:—

The dip of the flange is such that the traffic always rolls on to its face and never against it. The innovation is that the flange of the cover frame is placed at the surface level, and is so rounded and pointed that it at once

(1) Presents an inclined plane or a very flat curved surface to the traffic, avoiding all danger from sharp edges and giving an easy run on to the cover.

(2) The road material against the frame is reinforced by passing into or through the flange holes or pockets, so that all tendency of the road material to slide or crush away from the frame is eliminated.

(3) The road surface cannot wear down below the surface of the flange, because the flange carries the loads and prevents it.

(4) The raised bed for this flange supports the road material surrounding the cover frame, and always preserves a cushion of road material around the [illegible] which

ordinarily takes place. Hitherto this has never been efficiently accomplished.

(5) The flange resting upon the new bed transmits the loads directly to the walls of the manhole, and thus protects the main walls or body of the frame.

(6) The grouted raised bed reinforces the frame, and prevents fractures from loads striking laterally, as is apt to occur with ordinary frames.

(7) The cover cannot tilt or rock in its frame, as no dirt or stones can lodge upon its seatings, and it is self-adjusting.

(8) The joint between the cover and frame is protected from dirt, and therefore the cover is always easily lifted.

(9) Paving not being required effects a saving of 14s. to £1 per cover, as a set-off against any extra cost of cover.

(10) In solid covers grease may be put in the groove at the upper seating, and thus secure that the covers are perfectly sealed and airtight.

(11) Where it is necessary to prevent any surface water entering the manhole through the joint between the cover and frame, drainage holes are provided above the upper seating of the frame to carry off all surface water that may find its way into that joint, thus making an ideal cover for dry manholes or surface pits.

(12) A cover frame to meet present-day traffic, avoiding danger to quick-speed vehicles, giving an easy passage over the cover, with its metal distributed to prevent fractures from increased and

heavier traffic, and in every respect a cover to meet future needs.

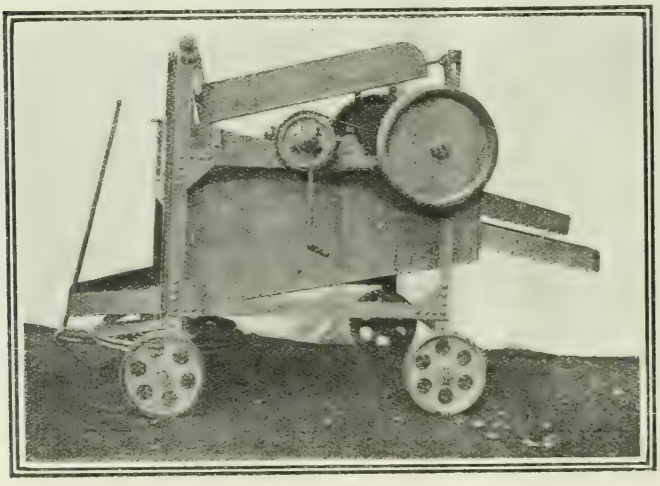
This cover and frame may be had of various designs, or the same principle may be applied to any engineer's specially designed cover upon application.

It may often be observed that in composite roads having part sett paved and part macadam, the macadam abutting upon the paving is quickly worn into holes, evidently through the wheels of heavy traffic suddenly passing from the harder on to the softer material; especially is this the case when the surface water does not freely run away from the meeting edge at the junction of such materials. The application of the patent edging prevents the disastrous effect of the sudden passage of the wheels from the harder on to the softer material by reinforcing the softer material at the junction with the harder, and gradually uniting one with the other.

Further particulars and prices can be obtained from the sole makers, W. E. Horsman & Son (over thirty years with G. Waller & Son), sanitary engineers, 127 Pendle-road, Streatham, London, S.W.

"MULTI-RAPID" SCREENING MACHINE.

The machine illustrated herewith is capable of screening 25 to 125 yds. of material per day, according to which hand or mechanical power is used. It will screen three grades at once, and is suitable for



The Multi-Rapid Screening Machine

sand and gravel pits, brickfields, destructor works, gasworks, and should be found invaluable by road contractors. Messrs. W. E. Horsman & Son, 127 Pendle-road, Streatham, S.W., are the sole makers.

To Manufacturers.—Mr. William H. Eley, engineer and surveyor to the Newmarket Urban District Council, writes: I shall be glad to know through the kindness of your columns of any makers of steam or motor wagons for removal of house refuse, street watering, or general haulage of road materials.

Labourers' Cottages in Ireland.—The Chief Secretary for Ireland was asked in the House of Commons, on the 10th inst., whether, in view of the difficulty during the period of the war of procuring a sufficient sum of money from the Treasury to finance in whole pending schemes for the building of labourers' cottages in Ireland, the portion of the schemes dealing with applicants whose present houses had been condemned as insanitary and unfit for human habitation would be proceeded with. Mr. Birrell said the reply was in the affirmative; but it would be necessary for the rural district council in each case to satisfy fully the Local Government Board that the occupants of such dwellings could not be otherwise provided for before this portion of the scheme could be authorised to be proceeded with.

MEXPHALTE—CLINKER ROADS.

At the stands of Highways Construction, Limited, and Anglo-Mexican Petroleum Products Company, Limited, at the National Road Exhibition, surveyors will have an opportunity of inspecting samples cut from roads composed of clinker dust and Mexphalte laid by Mr. E. J. Lovegrove, the borough surveyor of Hornsey.

The notices which have already appeared regarding this new process have aroused considerable interest. The clinker—as described in last week's Surveyor—is from the borough council's dust destructor, and, without sorting or selection, is pulverised in a lightning crusher yielding a mineral aggregate ranging from ¾ in. to a fine impalpable powder equal in fineness to cement. This material appears to have a natural affinity for Mexican bitumen, with which it forms a tough, homogeneous and resilient compound admirably adapted for carpeting worn macadam roads. The bitumen used is the well-known brand Mexphalte, and the material was mixed in a portable mixing plant loaned by Highways Construction, Limited.

Specimens of road and graded samples of the clinker dust are exhibited at the stands of the companies referred to, where further information and printed matter relating to this process can be obtained.

Dunfermline Waterworks.—The Dunfermline District Committee have reached a settlement for the purchase of land at Glendevon for the erection of the reservoir and other works. The purchase money, which amounts to £10,515, was fixed by valuation.

Coast Sand Dunes (By Gerald O. Case, St. Bride's Press, Limited, 24 Bride-lane, E.C., price 5s.).—The rapid increase of sand wastes around our coasts is indeed a serious one, and Mr. Case has done a valuable work in the writing of this book.—*Southport Guardian.*

The Civic Engineer's Who's Who, compiled by the editor of The Surveyor and Municipal and County Engineer, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Ltd. —*Liverpool Courier.*

Society of Engineers.—On June 17th members of the Society of Engineers and their friends visited the works of the Edison & Swan Electric Light Company, Limited, at Ponders End, Middlesex. The visitors had as their principal object an insight into the process of "Royal Ediswan" electric lamp manufacture, but they also had an opportunity of visiting the engineering section where every department was working "to deliver the goods" such as switches, switchboards, instruments, and other electrical accessories required for Government use; extra hands and extended workshops have enabled the additional output to go ahead with very little interruption of their usual trade.

Property Owners and Sanitary Reform.—A discussion took place at a recent meeting of Oakengates Urban District Council on the excuses put forward by some property owners for not carrying out very necessary sanitary reforms when ordered to do so by the council. Mr. G. Davies remarked that if, owing to the war, they must hold their hands in the matter of sanitary reform, it would be as well to obtain the consent of the Local Government Board to dispense with the services of the medical officer of health and sanitary inspector. The sewerage scheme had been carried out at great expense, and property owners must connect their property with the sewers. Other councillors agreed with the observations of Mr. Davies, and the council's officers were instructed to see that the necessary work was done.

The Surveyor
And Municipal and County Engineer.

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further, that the commencement that has been made in applying the powers lying to their hand will be exercised with the greatest possible vigour in rectifying, as far as possible, the blunders of the past in securing proper roads and streets in connection with all present-day schemes, and in providing that future ratepayers will be spared the expense of undoing work which ought not to have been done, and will look back upon the labours of town planners of the present generation with approval, and, it may be, gratitude and admiration.

CONGESTED AREAS.

Scotland possesses, in common with England, her full share of natural beauty, but she has as well many ill-designed and unwholesome areas. Somewhat that progress is being made by the town authorities of Scotland in the improvement or obliteration of these black spots. Progress may be slow, but, nevertheless, excellent work is being done.

In all old towns this problem arises, and, in my opinion, any scheme for the planning or replanning of a town is incomplete if it does not include the reconstruction and improvement of its congested areas and the widening of narrow traffic streets, as well as the lay-out of unbuilt-on land.

THE DUNDEE SCHEME.

In support of this view I might here appropriately explain the policy in the reconstructing and town planning of Dundee. The proposals, to be complete, are necessarily comprehensive, and in Dundee we have taken the precaution to look well ahead. They embrace

(1) A scheme of widening all existing and forming all new main traffic roads;
(2) A scheme of widening all narrow subsidiary roads;
(3) The removal or improvement of congested areas;
(4) The allocation of land for industrial and residential purposes;
(5) A scheme of parks and open spaces;
(6) The extension of existing and the construction of new tramways in new residential areas;
(7) The lay-out of all unbuilt-on land within and in the immediate neighbourhood of the city boundaries; and
(8) The provision of a civic centre.

The time at our disposal is not sufficient to allow me to enter into the details of these proposals, and it may be sufficient if I state generally—

(1) That, with regard to roads, plans of main traffic roads were prepared some years prior to the passing of the Act of 1909, providing for the widening of these up to the city boundaries, and, where widening was prohibitive, for the construction of new main traffic roads through unbuilt-on land, and that plans of narrow subsidiary roads were also prepared in which buildings were shown to be pulled down for the purposes of widening as opportunity arose;

(2) That, in attacking the housing problem, Dundee will operate in two ways—in the closing of insanitary dwellings on the one hand, and, on the other, in the acquiring of agricultural land at low rates within and beyond the city boundaries for the purposes of housing;

(3) That negotiations have already been in progress for the purchase of agricultural land, and we are hopeful that these negotiations will result in the purchase of land suitable for dwelling-houses which will enable owners of cottages to acquire building lots at an annual feu duty or ground rent of 20s. per house where there are ten houses to the acre, and where twelve or more houses to the acre, at a proportionally less sum per house;

(4) That tramway extensions and new public parks have been laid down for various localities;

(5) That one scheme for the removal and improvement of two congested areas is now in course of being carried out, the expenditure in connection with which, including the erection of new buildings, will exceed £1,000,000; and

(6) That the provision of a civic centre worthy of the city has been included in a comprehensive plan of the improvement of the central area of the city, and this scheme is best explained by the drawings which I now submit to the meeting.

I must apologise for having referred with a certain amount of fullness to what is being, and is proposed to be, done in Dundee, but as it is the scheme of town planning with which, naturally, I am best informed, I could speak of it with more authority than of any other scheme, of which there are many in course of preparation in Scotland.

The cities of Edinburgh, Glasgow and Dunfermline are engaged in schemes which will provide outstanding examples of town planning, and the county of Lanark is occupied with complex and important schemes, while the lead that is being given by the larger authorities is being followed, and will be further taken up by the smaller burghs.

These necessarily brief observations do not by any means give our English friends anything like a fair representation of the large amount of good work being done in the North, but it is hoped they are sufficient to indicate that local authorities and their officials in Scotland are sincere and earnest in their desire to make the fullest possible use of the powers conferred by the Act, and if the results are to be measured by consistent hard work and enthusiasm, and a determination to put an end to haphazard methods of lay-out, overcrowding, and jerry-building, then there need be no fear for the future of "town planning in Scotland."

Increase in Potteries Gas Charges.—Increased prices for gas in the Potteries towns supplied by municipal works are recommended by the Gas Committee of Stoke-on-Trent Federated Council. Advances of 6d. per 1,000 cubic feet, to 2s. 4d., are recommended at Burslem, Longton, and Fenton, and an advance of 7d. per 1,000, to 2s. 7d., at Stoke.

Ballinrobe Water Supply.—The Local Government Board have intimated to the Ballinrobe District Council that, owing to the restrictions put upon the borrowing of money by the Lords of his Majesty's Treasury, they were not prepared to sanction the loan of £3,600 applied for towards the improved water supply for the town, and suggested that the scheme should be left over till the termination of the war. The scheme had already been approved of, and the area of charge fixed.

The Suffering Roads.—The need for economy in road maintenance having been urged by members of the Dulverton Rural District Council, the surveyor, Mr. E. Groves, advised the council not to neglect their main roads on any account, otherwise they would find their grant adversely affected. Discretion should also be exercised lest the council, in trying to save a sovereign, found themselves called upon to pay a "fiver" for the repair of the same piece of road next year. After further discussion, the council asked the surveyor to use his discretion in the matter, suggesting that rigid economy be practised wherever possible.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. *Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.*

QUESTIONS.

This week answers are invited to the following questions:—

485. Building Construction. A casement window-frame is to be fixed in a cavity wall (10-in. stone facing, an inner facing of bricks, and a 2-in. cavity). Show clearly the methods of fixing, and any important features with respect to the relation between the window-frame and the cavity. (Mercian.)

487. Structures.—Find, graphically or analytically, the maximum deflection in a steel lattice girder of the N type, supported at each end, under a load of W tons applied on the bottom boom at a distance of 24 ft. from one support. Span of girder, 72 ft.; six 12-ft. bays; depth of girder 10 ft. Take safe intensity of stress in the members as 5 tons per square inch, and Young's modulus E=13,000 tons per square inch. There is no counter-bracing. Neglect the weight of the girder itself. (B. K., *Newport.*)

489. Road Making.—What is the best material from which to make paving setts for use in a carriage-way of steep gradients? Give reasons.

490. Hydraulics.—Find the ratio which must exist between the breadth and depth of water flowing in an open channel of rectangular cross-section, in order that the velocity of flow may be at its maximum. (N. W. K., *Bury St. Edmunds.*)

491. Books on Bridge Design.—Please give the name of a thoroughly practical book or books on the design of modern highway bridges. The book or books required must deal with the practical design rather than an abundance of theoretical calculation, and must be up to date. ("Tico.")

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

486. Sewage Ejectors.—How would you test the efficiency of a pair of 100-gallon alternating sewage ejectors with motor-driven air compressors? (C. A. B.)

Suppose the pressure of the air as it enters one of the ejectors is p lb. per square inch. Now a pressure of 14·7 lb. per square inch is equivalent to a head of 34 ft. of water. Therefore a pressure of p lb. per square inch is equivalent to a head of $\frac{34}{14·7} p = 2·3p$ ft.

Then, if w_1 is the weight in lb. of 1 cub. ft. of water,

Work done per cubic foot of water = work put in = $2·3 p w_1$ ft.-lb.

Also, if w_2 is the weight in lb. of 1 cub. ft. of sewage, and h is the vertical distance in feet that sewage is raised,

Work done per cubic foot of sewage = work got out = $h w_2$ ft.-lb.

$$\therefore \text{Efficiency} = \frac{\text{work got out}}{\text{work put in}} = \frac{h w_2}{2·3 p w_1},$$

neglecting a certain amount of kinetic energy which the sewage would possess when discharged from the rising main.

Take a numerical example. Find the efficiency of a 100-gallon ejector raising sewage weighing 65 lb. per cubic foot, the lift being 45 ft. and the air pressure at inlet valve 30 lb. per square inch. Weight of 1 cub. ft. of water = 62½ lb.

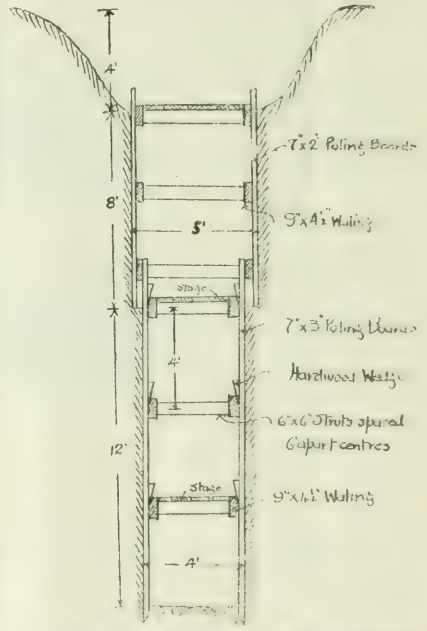
$$\text{Efficiency} = \frac{\text{work got out}}{\text{work put in}} = \frac{65 \cdot 45}{2·3 \cdot 30 \cdot 62·5} = 0·408.$$

The total lift can be obtained easily enough, but if the rising main is of considerable length, a correction must be made in the calculation for head lost due to friction in the main. The discharge in gallons for a given period can be found, and, the length and diameter of the rising main being known, the head lost from this cause could be allowed for, and added to the total lift.

For the work put in it will be necessary to obtain the pressure of the air just before entering the ejector. It is assumed in this answer that it is the efficiency of the ejector only, not that of the air compressor, that is required. Each ejector should be tested quite separately from the other, and care should be taken that the air pressure remains constant during the entire test. (B. K., *Newport.*)

488. Timbering.—Describe and illustrate by a cross-section the timbering of a trench in bad ground 24 ft. deep and 4 ft. wide.

The method illustrated is much used for soft and waterlogged ground. The excavation is carried down without any timbering for about the first 4 ft. and let come to the angle of repose of the earth. The next section for about 8 ft. is excavated and supported by upright sheeting waled and strutted. The excavation is continued by lining the trench with a second continuous system of poling boards pointed at the end. These are waled and strutted as shown. Between each poling board and waling



a hard wood wedge is inserted. The method of proceeding with the excavation is as follows: The wedges securing one poling board are loosened, and the earth from round the foot removed for a depth of about 12 in., the poling board is then dropped or driven as the earth is removed and re-wedged. Each successive poling board is similiarly dealt with until the whole length has been lowered to the necessary depth. Struts and walings are added as the poling boards descend. If running sand is met with, it is important that the feet of the poling boards should be kept in the ground, as if any of the vertical side is exposed the sand is liable to ooze out and leave the poling boards unsupported, and probably cause the whole system to collapse. If the trench follows the line of a road or street, it would be better to timber the trench from the ground level, as more space would be left for traffic. (J. G. W., *Downpatrick.*)

Institution of Water Engineers.

SUMMER MEETING IN LONDON.

The summer meeting of the Institution of Water Engineers was held on Friday last at Burlington House. Mr. T. Molyneux presided at the earlier part of the proceedings, and after his installation as president, Mr. F. W. McCullough (Belfast) took the chair. The attendance included Messrs. J. C. Barrowclough (Batley), A. B. E. Blackburn (Sunderland), W. J. E. Binnie (Westminster), F. H. Brunt (Rochdale), W. T. Burgess (London), R. C. F. Busfield (Fareham), I. Carr (Widnes), J. Chisholm (Airdrie), W. Clemence (London), C. Clemesha-Smith (Wakefield), A. H. Cooper (Wey Valley), A. E. Cornewall Walker (Redhill), F. W. Davies (Nottingham), F. I. Dixon (Ashton-under-Lyne), J. T. Edwards (Leicester), Percy Griffith (Westminster), H. C. Head (Winchester), W. R. Jenkins (London), Baldwin Latham (London), H. Lapworth (Westminster), Wm. Matthews (Westminster), F. W. McCullough (Belfast), T. Molyneux (Stockport), C. B. Newton (Hull), H. Preston (Grantham), C. H. Priestley (Cardiff), R. B. Rigby (Bury), C. H. Roberts (Aberdeen), E. Sandeman (Westminster), J. Ward (Derby), and W. Whitaker (Croydon) — members; H. Blakemore (London), H. Dewey (London), A. E. Drown (Westminster), J. E. Edmondson (London), D. Kirk (Coatbridge)— visitors.

Mr. P. Griffith, secretary, read the minutes of the nineteenth general winter meeting, which were confirmed.

NEW MEMBERS.

The Chairman announced that the following candidates had been elected since the winter general meeting held on December 11, 1914:—

As Members: Messrs. H. J. Rofe, Westminster; and W. A. Walker, engineer and manager, Higham and Hundred of Hoo Water Company.

As Associate Members: Messrs. G. A. Ballard, assistant borough engineer, Guildford; J. H. Bird, waterworks manager, Neath; W. J. Goode, engineer and surveyor, Buckfastleigh; N. Platt, assistant waterworks engineer, Wakefield; S. Reason, late assistant engineer, water department, Antofagasta and Bolivia Railway Company, Chile; W. Thompson, corporation water engineer, Bridlington; and T. Nicholas Young, waterworks engineer and manager, Epsom.

Transferred from Associate Member to Member: Mr. R. J. Hartley, waterworks engineer, Halifax.

INSTALLATION OF PRESIDENT.

Mr. MOLYNEUX: Mr. F. W. McCullough, Justice of the Peace for the city of Belfast, member of the Institution of Civil Engineers, and water engineer to the Belfast Water Trust, was elected unanimously by you at the winter meeting to be president of this institution for the year 1915-16, and he needs no words of commendation from me in formally introducing him to you. I feel I am voicing the sentiments of you all when I say that, while we welcome him heartily on his own behalf, we have a particular thought of him as the representative of the Sister Isle. We all regret the fact that we are installing him here in London instead of among his own people, so that we could have shown them how high he stands in our regard and esteem, but we hope that by next summer better times will have arrived, and that we shall then have the opportunity which we lack to-day. Mr. McCullough was one of the first members of the association in 1896, he has been a member of the council since 1910, and, notwithstanding the handicap of a sea voyage, has been most assiduous in his attendance; his advice and counsel have always been most valuable. I tender him on your behalf his certificate of office, with the hope that he may have good health and enjoy the ensuing as I have done the past year, and I can assure him that he will have the hearty support of one and all.

The PRESIDENT: My first duty as your new president is to propose that a hearty vote of thanks be given to our immediate past-president, Mr. Molyneux, for the very dignified and successful manner with which he has filled the position of your president in the past year. Mr. Molyneux has given the greatest satisfaction to all the members, and has specially endeared himself to every member of the council by his courtesy and energy, and the active way in which he has dealt with all matters brought before the institution during the past year. He has fulfilled his anticipations, and with, as the latter has a larger membership this year than when he took office, and, if possible, it stands in a higher position as an institution. I ask members to pass the vote with acclamation.

The proposition having been adopted,

Mr. MOLYNEUX said: I thank you, Mr. President, for the kind words you have used in proposing the vote of thanks to me—I only hope I have deserved them—and you, gentlemen, for the way in which you have received it. My year of office commenced, I venture to think, auspiciously at Stockport in June last, but the awful unforeseen events which have happened since have, I am afraid, rather made our thoughts wander from the work which this and kindred institutions are doing, and the suspense and anxiety which some, if not all, of us have experienced, and are experiencing, somewhat militates against concentration on anything more than work which is absolutely necessary for the well-being of our fellows. I have enjoyed the work during my term of office, and, like all my predecessors, cannot retire without expressing appreciation of the valuable services our secretary renders, which are, I think, particularly patent to the president. With regard to the members of the council, I thank them for the support they have given me in the council meetings, and, gentlemen, you may rest assured that, while they support the president, the work they do is not done with that unanimity which so often means indifference, but with that healthy criticism which has the interests of the institution at heart.

WORK OF THE INSTITUTION.

The PRESIDENT afterwards delivered an address—from which we make some extracts—on the work of the institution during the past year. He had, he said, to thank the council for his nomination, and the members of the institution for his election as their president for the coming year. He appreciated this honour very highly, probably more so than any of his predecessors, because, although he had been a member from the establishment of the "Association" in the year 1896, he was one of a very limited number hailing from Ireland, and therefore his selection to fill the highest position they could offer was, to him, a valued compliment, and he willingly accepted the many responsibilities of the office in the hope that, with the full sympathy and ready assistance of every member, he should be enabled to continue the good work and extend the usefulness of the institution during the coming year. The work of the institution was by no means limited to the proceedings at their general meetings, and their progress was clearly indicated by the membership roll during the past three years. [This shows an increase from 401 to 428.] The increases were not large, but a glance at the list of members would show that, in securing the support of men who truly represented the water engineers both of the present and of the future, the institution was steadily advancing in the right direction.

Mr. McCullough proceeded: During the past year the council have had under consideration many matters of importance both to our profession and to the authorities we serve. Among these may be mentioned the assessment of water undertakings for income-tax. Although the council were advised that it was not worth while for the institution to intervene for the purpose of securing an allowance for depreciation in *all* such assessments, members are advised that the decision arrived at by no means precludes them from applying individually for such allowances. The fact that the matter could not be taken up on behalf of water authorities generally must not be assumed as implying that the claim is untenable in all cases.

The question of standardising contract clauses for the use of water engineers, referred some time back to a committee of the council, has now been definitely advanced by the preparation of a draft set of model clauses which will shortly be discussed by the committee, and which will probably form the basis of a report to the council. It is therefore to be hoped that this important matter will be brought before the members during the ensuing year.

The council are also considering the possibility of remodelling the standard clauses defining the term

"domestic supply" and regulating the charges for water supplied for purposes "other than domestic." The question is one of considerable complexity, and the existing standard clauses are of great antiquity, so that it will not be easy to suggest what action should be taken; but the council are considering the question on broad lines, with a view, first, to avoid litigation or disputes between water authorities and consumers; and, secondly, to protect the interests of both water authorities and consumers, and no action will be taken unless these results may reasonably be attained thereby.

In conclusion, I may be permitted to express the regrets of the Lord Mayor of Belfast, and of my chairman and the members of the Belfast Water Trust, that the unforeseen circumstances created by the war have necessitated the postponement of the summer meeting in Belfast, and I hope that the cessation of hostilities, and the settlement of the European crisis to the full satisfaction of Great Britain and her gallant allies, will permit the members of the institution to visit Belfast at no very distant date.

(To be continued.)

TOWN PLANNING INSTITUTE.

ANNUAL MEETING.

Mr. Raymond Unwin occupied the chair at the annual meeting of the Town Planning Institute on Wednesday afternoon. The proceedings, which took place at the Surveyors' Institution, were attended by, among others, Messrs. G. L. Pepler (Local Government Board); H. E. Stilgoe, city engineer of Birmingham; J. W. Cockrill, borough engineer of Great Yarmouth; W. Harpur, city engineer of Cardiff; W. T. Lancashire, city engineer of Leeds; W. L. Carr, engineer and surveyor to the Ruislip-Northwood Urban District Council; E. Willis, engineer and surveyor to the Chiswick Urban District Council; J. A. Webb, engineer and surveyor to the Hendon Rural District Council; J. Thomson, city engineer of Dundee; W. R. Davidge, district surveyor for Lewisham; and A. R. Potter (secretary).

In an account of the work of the institute presented by the chairman, it was mentioned that the membership roll had been increased by ten members, sixteen associate-members, one legal member, three legal associate-members, six associates, and two honorary members—thirty-eight in all. The policy of uniting in the institute members of the professions connected with town planning was stated to have been amply justified by the very great interest and value of having each point of view represented in the discussions. It had also the advantage of providing a wide choice of subjects on which attention could be concentrated. It was added that it was proposed during the coming session seriously to consider the question of instituting an examination on town planning as an avenue for membership.

A paper on "Town Planning in Scotland," which was afterwards read by Mr. Jas. Thomson, the city engineer of Dundee, is reproduced on another page of this issue.

Axle Weights.—The Friary, Holroyd and Healey's Brewery, Limited, Guildford, were summoned before the Surrey County Bench on June 16th for causing to be used at Spa Bottom, Esher, on June 2nd, a heavy motor-car, the back axle weight of which exceeded the registered weight.—Mr. C. B. Watson, solicitor, from the clerk's department of the Surrey County Council, said that the case was similar to one which had been dealt with a few days previously. He had then pointed out that great damage was done to the Surrey roads by the heavy motor traffic, and until the overloading of these vehicles was stopped the roads in Surrey would never get a chance. Evidence was given by Frederick V. Chalker, clerk in the surveyor's department, that he weighed the defendant company's petrol lorry on the county council's weighbridge at Spa Bottom, and found the back axle weight to be 6 tons 18 cwt. 2 qrs. 14 lb. The registered weight was 6 tons. The load consisted of barrels and crates of beer. A representative of the company said he could not dispute the figures, but he pointed out that the total load was not excessive, as the front axle weight was only 2 tons 8 cwt. Mr. Watson: You are only summoned in regard to an offence with the back axle. The chairman, in fining the defendants 40s. and £2 2s. costs, said that it was the load on the rear axle which did the damage to the roads.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Wouldn't a "pronouncement" as to the effect of tarring flint roads be very useful to road engineers at the present time? Was it not very interesting to note recently the statement of Mr. Heslop, the county surveyor of Norfolk, that he had to sweep the dust and grit back on to his flint roads during dry weather in order to preserve them? But could not this be followed up by him with some information as to whether tarring the surfaces would not be equally efficient, and, in the long run, more economical, and also prevent the dust rising, as it is said to do, in large clouds in these districts where the roads are thus treated with dust?

* * * *

Is not the failure of the sewage farm at Stafford properly to treat the sewage—as stated at the recent Local Government Board inquiry—an object lesson to those engineers and others who still raise the cry of "the sewage back to the land"? Is it not a fact that there are now but very few successful broad irrigation sewage farms left in this country, and that these are only where the land happens to be of excessive porosity, and exactly suitable for the purpose of purifying sewage? Does not the ever-increasing addition of trade wastes to our sewage make the problem of proper purification more and more difficult?

* * * *

Is it not rather interesting to follow the "history" of municipal engineering during the last fifty years? Has there not been a succession of subjects in somewhat the following order—sewerage, sewage disposal, housing of the working classes, electrification of tramways, small holdings, roads, town planning? What will be the next subject that will exercise our minds? May it not possibly be in the direction of increased traffic, at greater speeds and weights, and a complete revolution in the present methods of construction of our roads and streets?

* * * *

Shall we not hail with pleasure Mr. Lovegrove's recent investigations into the construction of a bituminous road carpet made with clinker from a refuse destructor? If this experiment is successful, will it not lead to a useful application of a waste material—the residue of another waste material—which hitherto has only been sparingly used in the manufacture of mortar and concrete, whereas, if it is successful in the direction of Mr. Lovegrove's experiments, will it not solve many of the problems connected with its disposal, and eventually lead to a very cheap form of road-surface construction? Will it not be possible also to construct an entire road, from foundation to surface, of this clinker, and thus solve the problem of a reliable, resilient, rutless road?

* * * *

Has not the Labour Bureau scheme rather failed to come up to expectations? Do we not hear on all sides of persons who require labour of various descriptions being unable to obtain it on application at the bureaux? Cannot something be done to make the department of real practical use, instead of confining its benefits, as seems to be the case at present, to those employed by the Government to administer it?

* * * *

Why is it that the Orphan Fund of the Institution of Municipal and County Engineers is not more generally supported by the members of the institution? Is it not to be regretted that for the past year the subscriptions realised only £132 12s. 6d. from 1,769 members, and that, were it not for the generous support given to the fund by men who have retired from municipal service, and by other "outsiders," the subscriptions would be quite insignificant? What can be done to stimulate interest in this fund? Do the majority of members of the institution really realise the great benefits of such a fund, and how largely these benefits might be extended if the fund were more worthily supported?

Destructor Clinker Roads.—Surveyors will be interested to know that the pulverising of the destructor clinker employed by Mr. E. J. Lovegrove in the construction of these roads at Hornsey is effected by one of the machines of the Patent Lightning Crusher Company, Limited, 14A Rosebery-avenue, E.C.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR *readers with a view to making information given under this head as complete and accurate as possible.*

The following are among the more important projected works of which particulars appear below:—Buildings—Hessle, Oswestry, West Sussex, Worcestershire; housing and town planning—Middlesbrough; roads and materials—Aylesbury, Bermondsey, Devon, [illegible], St. Helens; water, gas and electricity—Axminster, Salford. Particulars of other projected works will be found on page [illegible] Local Government Board Inquiries [illegible].

BUILDINGS.

Arbroath T.C.—The burgh surveyor, Mr. P. C. Smith, has received instructions to prepare an estimate of the cost of a hospital for the treatment of tuberculosis.

Dundee T.C.—The Public Health Committee recommend the town council to provide [illegible] for the treatment of measles at the King's Cross Hospital.

Hebburn U.D.C.—The council have decided to erect six public conveniences.

Hove T.C.—Plans have been prepared for a cookery and domestic subjects centre at Connaught-road school at an estimated cost of £1,200.

Oswestry T.C.—The council have decided to oppose a scheme proposed by the Salop County Council for the erection, at a cost of £20,000 [illegible] hospital to serve eight urban and rural districts in North-West Shropshire.

Shipston-on-Stour R.D.C.—The surveyor, Mr. C. J. Gander, has received instructions to prepare alternative plans for building under Shipston bridge or rebuilding the structure as a girder bridge.

Surrey C.C.—The Highways and Bridges Committee report the practical completion of the strengthening of the old part of Cobham Bridge and the works in connection with the widening of the bridge.

Wellingborough U.D.C.—Provision has been made in the estimates for the construction of underground lavatories at a cost of £1,000.

West Sussex C.C.—It is intended to build a school at Crawley, at an estimated cost of £4,945, and a school at Horsham, at an estimated cost of £5,408.

Worcestershire C.C.—It has been decided to build a new school at Malvern, at an estimated cost of £4,679.

HOUSING AND TOWN PLANNING.

Brighton T.C.—A satisfactory report was presented last week on the finances of the working-class dwellings. The Health Committee have discharged over £1,000 of the debt on the buildings, although there was a deficit of £200. The interest and loan charges for the year were over £2,000, of which it was estimated that about half was capital and half interest.

Longbenton U.D.C.—The Local Government Board have authorised the council to prepare a town planning scheme.

Middlesbrough T.C.—The Streets and Plans Committee have approved generally the alternative scheme of the borough engineer, Mr. S. E. Burgess, for laying out the Saltwells estate, and have appointed a committee to confer with the landowners on the subject.

Selby U.D.C.—A site has been purchased in Flaxley road for the erection of industrial dwellings.

REFUSE COLLECTION AND DISPOSAL.

Beckenham U.D.C.—The surveyor, Mr. J. A. Angell, presented a report on the disposal of the destructor clinker, advising that the manufacture of tar-macadam therefrom should be discontinued for the present, and that such of the material as was not sold should be utilised for making up the roads on the allotments at an estimated cost of £150 for cartage and labour. The council agreed to adopt the proposal.

Grimsby T.C.—The Household Scavenging Committee at its last meeting decided to purchase, and accepted a tender for, an up-to-date covered four-wheeled tip wagon for the collection of house refuse.

Itchen U.D.C.—The Roads Committee have been authorised to carry out the removal of house refuse in certain districts by direct labour after the existing contracts expire.

ROADS AND MATERIALS.

Aylesbury R.D.C.—The Road Board have sanctioned a scheme of road repair at Halton, at an estimated cost of £2,241.

Bermondsey B.C.—The quotation of the borough engineer and surveyor, Mr. R. J. Angel, at £1,500, has been accepted for paving works in Tower Bridge-road.

Brighton T.C.—It has been agreed to purchase the forecourt of 39 Dyke-road and a strip of land at the rear of the premises in Prestonville-road for the purpose of street improvements.

Devon C.C.—In a report presented at this week's meeting, the Bridges, Main Roads and County Buildings Committee reported that in accordance with the instruction of the council to hire plant in preference to purchasing it in any case where the available terms of hiring were reasonable, they invited fresh tenders, but these were so high that it was resolved to purchase for use on the main roads in Division 1 a steam traction engine, a Baxter stone-crusher, two tipping wagons, and a water-cart, and, for the Exeter to Okehampton main road, two steam tractors and four trailer wagons; also roller wheels and appliances in order that the traction engine might be used as a steam roller, the total cost being £2,362.

Dunfermline T.C.—A draft agreement with the Earl of [illegible] has been approved [illegible] to [illegible] Victoria Road.

Egham U.D.C.—Plans have been approved for making up Park-avenue and South-avenue.

Haddington T.C.—Various road repairs are to be carried out, at an estimated cost of £120.

Kidderminster R.D.C.—It has been agreed to carry out an improvement on the road from Barnett Hill to [illegible], at an estimated cost of £140.

Linlithgowshire C.C.—In reference to the recent suggestion of the Road Board that, where possible, all schemes involving large sums of expenditure should be deferred for the present, it was stated at the Bathgate District Committee meeting that there had been further correspondence with the board on the subject. The district committee had written to say that they could not accede to the suggestion in certain cases, as the work had already been commenced. The chairman, Mr. W. Cuthbertson, pointed out that they had schemes in hand where the work had been started last year, and a good deal of money already spent on them. The Bathgate District Committee had applied for sanction to a loan of £1,800 for the purpose of improving the Bathgate and Airdrie and Bathgate and Blackburn roads. The Standing Joint Committee had intimated that, unless the works in question were actually necessary, they would not sanction a loan. After considerable discussion, the feeling of the meeting was to take the necessary steps to satisfy the Standing Joint Committee that the work for which the money was required was an actual necessity.

Mytholmroyd U.D.C.—A letter has been received from the Local Government Board sanctioning the payment of reasonable expenses incurred by the surveyor, Mr. S. Sutcliffe, in attending the Road Conference in London, and intimating that such sanction could not extend to any other delegate.

Nuneaton T.C.—The Estates Committee recommend that the footpaths of Riversley Park should be tar-sprayed, at an estimated cost of £50.

Paddington B.C.—It has been decided to carry out paving works at Woodfield-road wharf, at an estimated cost of £150.

Pontardawe R.D.C.—A letter was received recently from the Glamorgan County Council in regard to a suggestion made to them some time ago as to the tar-macadamising of some of the county roads in the neighbourhood of Pontardawe. The letter stated that a comprehensive scheme for coating a large number of main roads in the Swansea division, including

Pontardawe, had been prepared and approved by the county. It had now been sent to the Road Board. The scheme was still under the consideration of the Road Board, and they were apparently disinclined to make any grants towards such schemes in the present state of public affairs. The county surveyor hoped, however, to be able to secure a grant later on.

Stanley (Durham) U.D.C.—The surveyor, Mr. A. Routledge, has received instructions to carry out an experimental scheme of tar-spraying.

Westminster T.C.—The Finance Committee of the London County Council have sanctioned a loan to the city council of £50,000 in respect of the council's contribution towards the cost of the Thames-embankment extension and other street improvements.

Wincanton R.D.C.—The attention of the council having been drawn to the possible danger to fish life in the river Brue by a proposal to carry out tar-spraying at Bruton, it has been decided to meet the wishes of the residents of the district to tar-spray the roads if they agreed to give the district council an indemnity to pay one-half of any future expense involved in the operations. The mover of the proposition said that personally he thought the risk was nominal.

Worcestershire C.C.—It has been agreed to reduce the estimates of road expenditure by £5,000.

SEWERAGE AND SEWAGE DISPOSAL.

Chertsey R.D.C. The Local Government Board have written that they had had under consideration the report made by their inspector, Mr. Tulloch, on the application of the council for sanction to borrow £1,947 for the enlargement of the pumping station at Byfleet, and the provision of new machinery. In ordinary circumstances the board would have sanctioned the loan, but they were now only sanctioning loans for new expenditure in cases which were a pressing necessity either for reasons of public health or on account of war requirements. They were unable to sanction the loan at the present time. The board also referred to the council's letter asking for the borrowing of a further sum of £347 for works of surface-water drainage for the parish of Byfleet, and requested that the board might be furnished with certain particulars on an enclosed form. The council decided to supply the information asked for.

Hambledon R.D.C.—The council have given notice of their intention to promote a scheme for the drainage, levelling, and improvement of Ewhurst Green.

St. Austell R.D.C.—The council have referred to the Sanitary Committee a letter received from the Local Government Board with respect to the Bugle and Stenalees drainage schemes.

St. Helens T.C.—Plans have been approved for the construction of a new sewer in Horace-street.

Southend T.C.—The tender of Messrs. Pearson, Westminster, at £160, has been accepted for the supply of a steam boiler for use as a stand-by boiler at the sewage works.

WATER, GAS, AND ELECTRICITY.

Axminster R.D.C.—Councillors for Stockland have been asked by the council to go into the question of providing a water supply for the district.

Dublin T.C.—The council on Monday last decided to increase the charges made to the local electric lighting and power

Hammersmith B.C.—The borough council have expressed approval in principle of the proposal to link up the electricity generating stations with those of Battersea and Fulham.

Ossett T.C.—It has been decided to provide new plant for tar distillation, at an estimated cost of £700.

Salford T.C.—The question of purchasing electrical plant at an estimated cost of £4,277 is under consideration.

Smethwick T.C.—The Gas Committee report that the nett profit for the year ended March 31st was £5,511, from which has been provided a contribution to public lighting and the district rate of £4,173, and one to the Free Library Committee of £50, leaving a surplus of £1,288 to be carried to the [illegible] account.

Wolverhampton T.C. The tender of the Underfeed Stoker Company, at £600, has been accepted for the supply of automatic stokers at the electricity works; also the tender of Ferranti, Limited, of London, at £438, for the supply of two sets of extra high tension switchgear for sub-stations.

MISCELLANEOUS.

Brighton T.C.—The council have agreed to make a further contribution of £493 towards the work of sea defence carried out by the East Sussex County Council for the protection of the roadway between Roedean and Rottingdean.

Hull T.C.—The question is under consideration of providing two motor ambulances for the removal of infectious cases.

Scarborough T.C.—The council have accepted with thanks an anonymous gentleman's offer to provide a motor ambulance for the general use of the borough, the local hospital to have the first call on its services, and the corporation to be responsible for its upkeep.

PERSONAL.

Mr. Sidney H. Morgan, surveyor to the Prestwich Urban District Council, has been gazetted second lieutenant in the East Lancashire Royal Engineers.

Mr. H. D. Woodcock, surveyor to the Guisborough Rural District Council, has joined the Army, and the council will at their next meeting appoint his father deputy surveyor.

Mr. J. R. Ridley, surveyor to the Stanhope Urban District Council, is, we are pleased to state, recovering satisfactorily from the injuries he received in a motor cycle accident a month ago.

Mr. Jepson, assistant in the borough surveyor's department, Kingston-on-Thames, has joined the Royal Engineers, and Mr. Bryan, a clerk in the office, is serving in France in Red Cross work.

Mr. T. Huddleston, surveyor to the Grange Urban District Council, has had his salary increased from £250 to £275 a year. Out of his salary Mr. Huddleston has to pay a clerk £40 a year.

Mr. T. A. Kingham, second assistant in the electricity department, Kingston-on-Thames, has been appointed chief assistant to the borough electrical engineer in succession to Mr. P. C. Simpson.

Mr. F. Hewitt, surveyor to the Kiveton Park Rural District Council, has applied for a commission in the Army, and the council have decided, should he be accepted, that his position be held open for him.

Mr. Burnett Bullock, Mitcham, has been appointed surveyor to the newly-constituted Mitcham, Surrey, Urban District Council at a salary of £250, rising to £300 per annum. Mr. C. G. Rabbetts, Mitcham, has been appointed sanitary inspector to the same authority at a salary of £200 a year.

Mr. M. A. Moynihan has been presented by the corporation waterworks staff with an illuminated address and a case of Irish-made pipes in honour of his appointment as deputy borough surveyor of Dublin. Mrs. Moynihan receiving on the same occasion a handsome tray and tea and coffee service.

Mr. Raymond Unwin, town planning assistant to the Local Government Board, was on Wednesday elected president of the Town Planning Institute, and Messrs. J. W. Cockrill, borough engineer of Great Yarmouth, and E. R. Abbott, clerk to the Ruislip-Northwood Urban District Council, were elected vice-presidents.

Mr. Eli Marsden has been recommended for the position of borough surveyor of Darwen rendered vacant by the death of Mr. R. W. Smith-Saville. Mr. Marsden is a native of Darwen, and was a student at the local secondary school, after leaving which he went to Owens College, Manchester. Twelve years ago he became articled to Mr. Smith Saville, and has been in the service of the corporation ever since. He has been entrusted with several important schemes, notably the Bolton water supply. Mr. Marsden is an associate member of the Institution of Civil Engineers. His commencing salary is £300.

Mr. John Robinson, surveyor to the Darlington Rural District Council, who is retiring in order to carry on his own business, was recently presented by the councillors and official staff with a silver tea service and silver-mounted tea tray. From the workmen Mr. Robinson received the gift of a gold albert and medallion. Mr. Robinson, who has served the council for nearly nineteen years, was complimented upon his "faithful and efficient service," more particularly with respect to the condition of the local

roads. In the course of his speech he said he had always tried to ascertain the most up-to-date methods, and he contended that tar slag for the roads which the council introduced would hold its own against anything brought forward. When he first took over the office the council had no steam roller, and after securing this they commenced the slag works in a small way, and introduced mechanical haulage traction engines and wagons, which had been superseded by petrol wagons, which had been more economical, and did less damage.

OBITUARY.

Lieutenant John Nixon Horsfield, A.R.I.B.A., F.S.I., whose death from wounds received in action at the Dardanelles has been reported, was a son of the late Mr. J. Nixon Horsfield, formerly surveyor to the Hampton Wick Urban District Council. He was educated at the City of London School, and was well known to rowing men, having twice represented at Henley the Kingston Rowing Club, of which he was a life member. He was only thirty-two years of age, and leaves a widow.

Mr. Robert Phillips, formerly county surveyor of Gloucestershire, died, we regret to state, at Gloucester on Sunday morning after a long illness, aged seventy-seven years. Mr. Phillips retired eight years ago but the county council retained his services as consulting surveyor. He was an associate member of the Institution of Civil Engineers, and a member of the Institution of Municipal and County Engineers, and of the Royal Sanitary Institute. He leaves one son Mr. Robert S. Phillips, architect to the County Education Committee, and three daughters, one of whom is the wife of Mr. W. J. Bache, the borough electrical engineer of Cheltenham.

CO-ORDINATION OF MILITARY AND CIVIL SANITARY SERVICES IN WAR TIME.

The above was the subject of a paper read by Mr L. S. Mackenzie, the city engineer of Bristol, at a meeting of the Royal Sanitary Institute held in that city on the 11th inst. under the chairmanship of Lieutenant-Colonel H. R. Kenwood, R.A.M.C.(T.), M.B., D.P.H. Those present included Messrs. T. H. Yabbicom (consulting engineer to the corporation), W. Harpur (Cardiff), T. H. Moss-Flower (Bristol), G. E. Ford (deputy city engineer), W. E. Laishmore and A. J. Claypole (city divisional engineers), F. Wilson and H. A. Palmer (district engineers), and H. W. Harding (chief architectural assistant to the city engineer).

Mr. Mackenzie observed that the scope of the civilian engineer and surveyor in war-time, as compared with that of the medical officer of health, would appear to be very limited. His local knowledge should, however, be of some assistance to the military authorities in the following directions: (1) Suitable sites for camps; (2) billeting accommodation; (3) water supply; (4) sanitary arrangements; and (5) reliable contractors. In the selection of camping grounds, apart from actual military necessities, the most desirable site would be gently sloping ground at a fairly high elevation, with good drainage, and covered with grass or low vegetation, as near as possible to a main road, and with an adequate supply of water.

As regards billeting accommodation, more especially in towns, the surveyor should have a pretty good idea where suitable buildings are, and thus save the military authorities much time in making inquiries. The chief requirements to be kept in view were that the buildings should be waterproof, as far as possible free from draughts, but at the same time thoroughly well ventilated, an ample supply of water, and, in the event of there being insufficient sanitary accommodation, plenty of facilities for extending this. The regulation air space per man allowed in barracks is 600 cub. ft., and the floor space 60 sq. ft., and, although in cases of emergency it might not be possible to give so much space, it is very important to avoid overcrowding. There was always a possibility of a man having acquired some infectious disease, and the closer men were billeted the greater the chance of the disease spreading. On the other hand, a bell-tent, having its full complement of fifteen men, only provides 12 sq. ft. and 32 cub. ft. per man. In large towns it would appear to be more convenient to utilise public halls, warehouses, factories, &c., but in rural districts it becomes necessary to billet the troops in private houses, and the accommodation to be obtained in this way was calculated at the rate of nine or ten per inhabitant. Special arrangements should be made for the removal of ashes and refuse at least once a day.

The water supply is a very important matter in war-time. The purity of the water was of the utmost importance. Small ponds should on no account be used for drinking water. As regards sanitation, this would probably be undertaken, in most cases, by the military authorities, but the surveyor would be able to give information as to any sewers that may be available. Lastly, he would be able to recommend the most reliable and capable building and haulage contractors in the district—information that should be very valuable to the military authorities.

Following a discussion, the chairman (reports the *[illegible]* remarked that what was really at the back of a good deal of the dissatisfaction in regard to co-operation of the civil with the military authorities was the intense desire of everyone to lend a hand. Medical officers and engineers wanted to give their services to the fullest possible extent, and they felt that that had not been the case, and perhaps the lack of recognition had led to the criticism often heard. He did not think the civil authorities did co-operate to the greatest possible extent with the military authorities. That was not the fault of the War Office, who had issued orders that the military authorities should seek the fullest possible co-operation of the civil authorities. The Local Government Board were equally keen on promoting that co-operation, and to that end had circularised the medical officers of health and appointed inspectors to specially work to this end. They found fairly good co-operation on the medical side, but extremely bad on the practical sanitation side. When engineers were consulted their advice was sometimes sought too late, in some cases after trouble had occurred which might have been avoided if their co-operation had been obtained earlier. The reason why the co-operation had not been better was capable of explanation. He did not think medical and sanitary officers quite realised that when any premises were taken over by the military they were solely responsible for the sanitary arrangements as for everything else. Army medical officers were highly trained, expert men, and under normal conditions there was no need to seek the help of the civil authorities. Owing to the war and the enormous growth of new armies, there was now reason for close co-operation with civil authorities. The Army attitude was that they would use the knowledge and services of the local authorities when they required them. He (the speaker) was of opinion that the services of local medical officers and engineers would be much utilised if they were less coy, and came forward more readily, especially where military provisions overlapped their own.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR *readers with a view to making the information given under this head as complete and accurate as possible.*

INQUIRIES HELD.

Rugby R.D.C. (June 15th. Mr. A. W. Brightmore).—£1,000 for works of sewage disposal for Dunchurch.—It was stated that the money was required to purchase the site of the existing outfall works, and for the purchase of land on the Daventry road for the provision of outfall works. The surveyor, Mr. T. W. Willard, stated that at the main outfall it was proposed to convert the existing catchpits chamber into a screening chamber, and to take the screened sewage to the septic tanks. Provision had also been made for dealing with the storm overflow. He had estimated that premises in which 835 persons were located would be connected with the sewerage scheme, but he believed the actual number would be rather less than this.

Stalybridge and Dukinfield Joint Sewerage Board (June 10th. Mr. A. G. Drury).—£28,539 for sewerage and sewage disposal.—It was stated that since the inception of the scheme in 1894 the total amount of loans sanctioned was £99,892. The amount of the present application in the first place was with respect to an excessive expenditure on the 1908 sanction of £13,564—namely, £2,204. The second item was expenditure on the 1911-12 sanction, amounting to £12,018 and £791, giving a total for these two of £13,510, less £5,000 provisionally sanctioned in October of last year, leaving a balance of £8,510. There was also an application in respect of new and additional works,

amounting to £17,825, giving the total amount asked for—£28,539. This money was necessary to meet the requirements of the Mersey and Irwell Joint Committee by completing works now in progress. At the last meeting of the board a resolution was passed to the effect that, failing any further sanction by the Local Government Board, the expenditure on the extensions should cease at the earliest time possible. Mr. C. J. Lomax, engineer, explained the plans, and said he wished to impress upon the inspector that, whatever else was granted, it was necessary that they should have money for the storm-water tanks.

Wrexham T.C. (June 18th. Mr. W. O. E. Meade-King). £6,056 for the erection of working-class dwellings under Part III. of the Housing of the Working Classes Act, 1890.—It was explained that a loan of £1,660 was approved nine months ago to enable the council to buy certain land, but as the owner definitely reserved the minerals in the draft contract, without payment of compensation for surface damage caused by the working of the minerals, the negotiations fell through, the council declining to take the risk of loss by subsidence. It is now proposed to utilise a portion of surplus land belonging to the corporation, and adjoining the slaughter-houses, for the erection of thirty houses, of which sixteen will be 5s. 9d. per week, including rates, and fourteen 5s. 6d., including rates.

APPLICATIONS FOR LOANS.

Audley U.D.C. £1,300 for a sewage disposal scheme.

Epsom U.D.C.—£1,000 for a motor fire engine.

Peterborough C.C.—£1,947 for main road improvements.

Wigan T.C.—£1,200 for the purchase of transformer switchgear and cables.

LOANS SANCTIONED.

Budleigh Salterton U.D.C.—£400 for works of water supply.

East Lothian C.C. £450 for drainage works at Innerwick.

Greenwich B.C.—£1,450 for a tuberculosis dispensary.

Hanwell U.D.C.—£4,000 for an isolation hospital.

Ilkeston T.C. £7,351 for the completion of the sewerage scheme.

Mansfield T.C.—£2,000 for electricity plant.

Paignton U.D.C.—£2,527 (for thirty years) and £260 (for ten years) for the extension and furnishing of the isolation hospital.

Southampton T.C.—£1,085 for the purchase of a motor fire engine.

Tiverton T.C.—£155 for the Bolham water supply.

York T.C.—£700 for the electric undertaking.

FORTHCOMING INQUIRIES.

JUNE.	£
29.—**Bristol.** For the purposes of the electricity undertaking (Mr. A. W. Brightmore)	27,295
29.—**Luton.** For the extension of the sewage pumping plant (Mr. P. M. Crosthwaite)	2,000
JULY.	
1. —**Aldershot.** For the purposes of the electricity works (Mr. A. W. Brightmore)	8,500
1.—**Macclesfield.** For the purposes of the water undertaking (Mr. W. O. E. Meade-King)	3,300
2.—**Wednesbury.** For offices and baths extension (Mr. W. O. E. Meade-King)	1,350

FOR OTHER ADVERTISEMENTS
See End of Paper.

WANTED, Second-hand Sanitary Tumbler Cart. Replies, stating capacity, condition and price, to be sent to W. Beard, Sanitary Inspector, Harlow, Essex. (2,613)

DOORKEEPER required. Practical experience on Public Works essential. Apply, stating age, experience, and wages required, William Perrey, General Manager, Water Department, Sheffield. (2,617)

WANTED — STOREKEEPER and YARD FOREMAN to a Municipal Authority. Salary from 30s. to 40s. per week, including house, fuel, and gas, valued at 7s. per week. Applications, stating age and experience, with not more than three recent testimonials, to be sent not later than Monday, 5th July, to Box 1,528, office of The Surveyor, 24 Bride-lane, Fleet-street, E.C. (2,616)

FRIERN BARNET URBAN DISTRICT COUNCIL.

ENGINEER AND SURVEYOR'S DEPARTMENT.

Required, a Temporary Assistant (during the War). Must be good practical Surveyor, Leveller and Draughtsman. Preference will be given to one with a municipal experience, but applicants must not be eligible for military service.

Further particulars and application forms can be obtained from the undersigned.

(By order of the Council)
E. J. REYNOLDS, A.M.I.C.E.,
Engineer and Surveyor.

Council Offices,
The Priory,
Friern Barnet, N.
June 23, 1915. (2,611)

THE MALDENS AND COOMBE URBAN DISTRICT COUNCIL.

Wanted, Temporary General Assistant, Surveyor's Department. Qualifications: Typewriting and book-keeping, and the surveying of drainage and building works in progress is essential. A knowledge of short-hand, surveying and levelling is desirable. Preference will be given to a candidate who has had previous experience in a similar office. Candidates must not be eligible for service in H.M. Forces.

Salary £2 10s. weekly, payable monthly.

Applications, in candidate's handwriting, stating age and experience, with copies of three recent testimonials, and endorsed "General Assistant," to be delivered to the Clerk of the Council not later than noon on Friday, 2nd July, 1915. Canvassing will disqualify.

Council Offices,
New Malden, Surrey.
June 22, 1915. (2,612)

TILBURY URBAN DISTRICT COUNCIL.

The above Council invite Tenders for the following

Broken Granite.
Granite Chippings.
Best Welsh Steam Coal.
Gas Coke.

Forms of Tender, &c., may be obtained from Mr. S. A. Hill-Willis, Assoc.M.Inst.C.E.I., Engineer and Surveyor to the Council, on and after Friday, the 25th June, 1915, on the production of a receipt from the Council's Accountant for a deposit of £2, which will be refunded on the receipt of a *bonâ-fide* Tender.

Sealed Tenders, on the Form and in the envelope provided, addressed to the undersigned, are to be delivered not later than the first post on Saturday, the 3rd July, 1915.

The Council does not bind itself to accept the lowest or any Tender.

(By order)
THO. A. CAPRON,
Clerk to the Council.

Council Offices,
Dock-road,
Tilbury.
June 23, 1915. (2,614)

COUNTY BOROUGH OF WIGAN.

The Corporation of Wigan invite Tenders for the completion of Greenhouses at the Mesnes Park, Wigan.

Specification, Bill of Quantities and Form of Tender may be obtained from Mr. A. T. Gooseman, Borough Engineer, King-street West, Wigan, on payment of a fee of £2 2s., which fee will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Greenhouses," to be delivered to me not later than noon on Wednesday, the 7th July, 1915.

The Corporation do not bind themselves to accept the lowest or any Tender.

WM. HENRY TYRER,
Town Clerk.

Town Clerk's Office,
Wigan.
June 23, 1915. (2,615)

The Effect of Springs Upon Water Levels in the Chalk of Eastern Surrey.*

By HENRY DEWEY, B.Sc.

The present paper deals with an area of some 30 square miles situated in North-East Surrey, between Epsom and Croydon. Most of this country consists of chalk, but a narrow strip along the northern edge is formed by the sands, loams and clays of the tertiary beds; and some plateaus and isolated hills on the east are capped with thick masses of pebbles.

The area is separated into two districts by a deep narrow valley, in which the town of Croydon has in great part been built. On the west the ground is gently undulating with a general northerly slope, the fields being wide, bare and exposed, contrasting in this respect with the deep sheltered dales and wooded hills lying to the east of the main valley. This change is abrupt and conspicuous, and when its cause is sought the importance of the beds of pebbles mentioned previously is realised. A short account of the geology of the whole area is necessary for a proper understanding of the movements of the subterranean waters and their escape as springs.

GEOLOGY.

The oldest rocks met with are the several varieties of chalk which lie one upon another in thick-bedded masses. Each of these several masses contains an assemblage of fossils which is more or less restricted to it.† The chalk is thus divisible into a series of layers which have been described as life-zones, and the several zones are known by the names of significant or characteristic fossils. Various species of sea-urchins have been chosen to indicate these zones, three names being *Micraster glyphus*, *Micraster cortestudinarium*, *Micraster coranguinum*, and *Marsupites testudinarius*. The economic importance of the recognition of these fossils lies chiefly in the ready determination of the position in the chalk of a particular bed or core—*e.g.*, a core from a borehole could be ascribed to its proper position above the base of the chalk if it contained any of these characteristic fossils. The importance of this is obvious when advice is to be given as to the continuation of a borehole for water supply.

Overlying the chalk are the tertiary beds. The lowest of these is a bed of fine, light yellow sand of varying thickness, but increasing from west to east up to 60 ft. This is overlain in turn by the Woolwich and Reading beds, consisting of some 40 ft. of green sands, mottled red and green clays, and variously coloured loams. The beds which lie upon the mottled clays to the west of Croydon are homogeneous blue clays, known as London clay; but east of Croydon a thick mass of pebbles with sand lies between the Woolwich and Reading beds and the London clay. The abrupt change of topography and scenery is due to the oncoming of these pebble beds. They are permeable to rain and form an arid and poor soil, suited to the growth of pine trees and heath, and the well-known commons at Shirley, Hayes and West Wickham are due to these beds. Their economic importance will be discussed later when their effect upon structure and water movement in the chalk is considered.

WATER LEVELS IN THE WELLS OF THE DISTRICT.

If the range of fluctuation of the water levels be considered, a very remarkable difference is seen to exist between the groups of wells situated respectively east and west of the Croydon Valley.

The range of fluctuation of the water level remains constant in the wells both of the western and eastern districts, but the two groups differ widely from one another, there being nearly four times as great a range in the wells on the east as there is in those on the west; the figures being 4¼ and 14 ft. on the west and 16 and 55 ft. on the east.

The causes of this difference must next be considered. First, the supply of water is, in both cases, the rainfall. This is indicated on the rainfall map of Surrey,‡ which shows that the isohyetal lines run nearly due east and west between Epsom and Coulsdon, but east of the Croydon Valley turn a little north, while a small area of higher rainfall is shown around Warlingham. There are no published data relating to the percolation of rain over the same area, but it is probably greater between Epsom and Croydon, owing to the bareness of the chalk, than it is east of that locality, where wide spreads of tertiary beds and clay with flints form the surface. The impermeability of these beds would tend to increase evaporation and decrease percolation, and so equalise the amount of water entering the chalk of the two areas. The difference of fluctuation must therefore be due to the escape of water which has already penetrated the chalk. Pumping may cause some of the difference, but in Lucas's time there were not many pumps working, and the difference was then even more pronounced than now. There is, however, a very obvious source of exhaustion in the many powerful springs which gush out from beneath the tertiary beds at Ewell, Carshalton, and Waddon. These emit annually many millions of gallons of water, and the continual drain on the underground resources must tend to lower the water level permanently. The actual quantity escaping in recent years from these springs has not been gauged, or if it has, the results are unpublished, so that Lucas's figures must be resorted to in calculating the effect upon the water levels. According to Lucas the amount of water which gains access to the chalk of the drainage area feeding these springs is 89,229,388,800 gallons annually, equal to a daily average of 244,464,078 gallons, while the amount flowing away at the springs is 39,156,680 gallons,* or, in other words, as much as 16 per cent escapes annually. On the east of the Croydon Valley there are none of these powerful springs, and all the water that percolates into the chalk flows down beneath the tertiary beds and tends to raise the water level over the whole catchment area.

The question of the cause of the springs is an obscure geological problem, but some significant facts may be mentioned. First among these is the faulted nature of the chalk near the outcrop of the tertiary beds between Epsom and Croydon. Almost everywhere in this district when artificial sections are cut in the chalk small slips and faults are exposed upon which water accumulates as drops, or sweats out from the rock. Similar faults are seen east of Croydon, but not nearly so frequently. The chalk, however, is jointed, and it is along these joints that the underground waters flow rather than through the rock mass itself.

Another feature of the western district is the presence of a series of shallow folds or undulations which lie on the main dip-slope. These increase in amplitude from Epsom to Sutton, where the dip is 10 deg., and decrease thence eastwards to Croydon, where it is only 1 deg. The dip of the main mass of the chalk is gently towards the north, but just beyond the outcrop of the tertiary beds it suddenly increases for a short distance and then flattens out into a gentle slope, thus forming a sort of step. This structure also ceases east of Croydon. All these structures are due to movements of the earth's crust, which resulted in the tilting and folding of the beds while accommodating themselves to the smaller space they had to occupy on account of contraction, and the beds which suffered most deformity were those which are now exposed on the west side of the main valley. It is significant that with the oncoming of the massive pebble beds on the eastern side of the Croydon valley, the deformity and faulting of the chalk diminishes in amount and the emission of springs ceases. There can therefore hardly be a doubt that the phenomena are correlated, even if the absence of springs is not consequent upon the presence of the pebble beds.

In conclusion, then, the chief points of the paper may be summarised in the following words:—

Two contiguous areas differ markedly from each other in the movements of their subterranean waters. This difference is caused by the emission of springs in one area and their absence in the other, which in

* Paper read at the Summer Meeting of the Institution of Water Engineers on Friday last.

† Mr. G. W. Young was the first observer systematically to investigate the zonal characters of the chalk of this neighbourhood (see "Proceedings Geologists' Association," vol. xix., pp. 188-219), since when Messrs. Hinde, Gossling, Wright and Polkinghorne have added to our knowledge of the subject.

‡ Water Supply of Surrey. "Memorandum Geological Survey, 1912."

* Lucas, "Horizontal Wells," p. 12, 1874.

turn i. due to differential effects of folding and faulting of the rocks of the two districts and by the presence of massive beds of pebbles on the east and their absence on the west. The rise and fall of the underground water in the eastern is about four times as great as that in the western district; while the amount of water escaping at the springs is equivalent to one-sixth of that which percolates into the chalk over the catchment area. From these figures it may be inferred that the underground waters follow defined channels rather than flow through the interstices of the mass of the chalk.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

ANNUAL SUMMER CONFERENCE.

The annual summer conference of the Association of Managers of Sewage Disposal Works will be held at Leeds on Saturday, July 10th, at 10.30 a.m.

Dr. H. Maclean Wilson, M.D., B.SC., will deliver his presidential address.

Mr. Geo. A. Hart, M.INST.C.E., will give an explanation of the works included in the main drainage and sewage disposal scheme—illustrated by cartoons.

Mr. John T. Thompson, M.SC., will read a paper, "Seven Years' Experience with a Large Sludge Pressing Plant"; discussion.

Visit to the Leeds sewage disposal works.

VISIT TO WEALDSTONE.

A visit to the works of the Wealdstone Urban District Council's sewage disposal works has been arranged for to-morrow (Saturday) at 3 p.m.

These works should prove of particular interest to visitors, fifteen of the filter-beds which have been completed being in successful operation, and four can be inspected in various stages of construction.

PROGRAMME.

3 p.m.—Visitors meet at L. & N.W. Railway station.

3.15 p.m.—Walk to sewage disposal works (fifteen minutes).

Reception by chairman of the council, Mr. J. H. Searcy, J.P., and chairman of the Sanitary Committee, Councillor F. W. Wale.

Description of the works by the engineer to the council.

5 p.m.—Visitors will be entertained to tea in pavilion, recreation ground.

J. B. CROLL,
Secretary

ROYAL SANITARY INSTITUTE.

YEOVIL MEETING.

At Yeovil, on July 14th, a discussion on "Water Supplies to Rural and Small Urban Areas" will be opened by Dr. W. G. Savage, county medical officer of health of Somerset.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

TEMPORARY ASSISTANTS.—June 28th.—Corporation of Chesterfield. £80 a year.—Mr. H. A. Bridge, acting borough surveyor.

SANITARY INSPECTOR.—June 28th.—Lewisham Borough Council. £150 a year.—Town Clerk, Town Hall, Catford, S.E.

TEMPORARY ASSISTANT.—June 29th.—Heston and Isleworth Urban District Council. £3 3s. per week.—Mr. J. G. Carey, engineer and surveyor, Council House, Hounslow.

SANITARY INSPECTOR.—June 30th.—Clare (Suffolk) Rural District Council. £130 per annum.—Mr. S. L. Bigmore, clerk, 2 Wratling-road, Haverhill.

TEMPORARY SURVEYING ASSISTANT.—July 1st.—Gelligaer Urban District Council. £120 a year.—Mr. Frank T. James, clerk, Hengoed, Glam.

INSPECTOR OF NUISANCES. July 2nd. Buxton Urban District Council. £120 per annum.—Mr. J. Taylor, clerk, Town Hall.

SURVEYOR AND SANITARY INSPECTOR.—July 10th.—Brumby and Frodingham Urban District Council.—Mr. G. S. Sowter, solicitor and clerk, Brigg, Lincs.

DRAUGHTSMAN.—Survey Department of the East India Protectorate. £160—£205 a year.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, *but those responsible for their despatch are recommended to arrange that they shall reach* THE SURVEYOR *office by noon on* WEDNESDAYS *to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.*

Buildings.

LEYTON.—June 29th.—For cleaning, painting and repairing various schools, for the Education Committee.—Mr. W. Jacques, 2 Fen-court, Fenchurch-street, E.C.

CONWAY.—June 29th—July 5th.—For the construction of steel girder bridge and approaches, and laying mains, for the Colwyn Bay Joint Water Supply Board.—Mr. C. F. Farrington, engineer, Trinity-square, Llandudno.

MIDDLESBROUGH.—June 29th.—For reconstruction work at public baths, for the Sanitary Committee.—Mr. S. E. Burgess, borough engineer.

ALDERSHOT.—June 29th.—For the erection of a brick-built block at the isolation hospital, for the urban district council.—Mr. F. C. Uren, surveyor.

BRADFORD.—June 29th.—For the erection of a school and other works, for the corporation.—City Architect, Town Hall.

HOMERTON.—June 30th.—For repairs and cleaning at hospital, for the Metropolitan Asylums Board.—Mr. W. T. Hatch, engineer, The Embankment, E.C.

LONDON.—June 30th.—For repairs and cleaning works at Homerton Asylum, for the Metropolitan Asylums Board.—Board Offices, Embankment, E.C.

BOOTLE.—June 30th.—For alterations to offices and sheds at the town hall yard, for the corporation.—Borough Engineer.

GODALMING.—June 30th.—For the erection of a sanatorium, for the Metropolitan Asylums Board.

MANCHESTER.—June 30th.—For the erection of piggeries, for the Sanitary Committee.—City Architect, Town Hall.

BARNSLEY.—June 30th.—For renovations at schools, for the Education Committee.—Mr. E. W. Dyson, architect.

MANCHESTER.—July 1st.—For the erection of an engine-house, for the Gas Committee.—Mr. F. A. Price, superintendent, Gas Department, Town Hall.

WEST RIDING.—July 3rd.—For repairs to schools, for the Education Committee.—Mr. A. Angus, West Riding Education Offices, Wakefield.

KENT.—July 5th.—For repairs to schools, for the Education Committee.—Mr. W. H. Robinson, architect, Sessions House, Maidstone.

ELY.—July 5th.—For the building of an isolation hospital, for the urban and rural district council.—Mr. S. J. Wearing, architect, 15 Upper King-street, Norwich.

[illegible]—For the erection of a shelter and conveniences, for the urban district council.—Mr. J. H. Castle, engineer and surveyor.

BEDS.—July 7th.—For renovation works at various schools, for the Education Committee.—Mr. R. K. Ellison, Shire Hall, Bedford.

WRENHAM.—July 8th.—For redecorating and painting certain buildings, for the corporation.—Mr. J. England, borough engineer, Willow-road.

Gas and Electricity.

BIRKENHEAD.—June 30th.—For the supply of a gas condenser and gas washer, for the corporation.—Gas Engineer, Gasworks, Thomas-street.

Engineering Iron and Steel.

BATTERSEA.—June 30th.—For the supply of iron castings, for the borough council.—Borough Engineer.

Calno
Reg.d

THE ONLY FIRE-RESISTING FIBRE
BUILDING BOARD
MADE IN
GREAT BRITAIN

Does not Split or Crack. Bound with Cement Binder.
Tensile Strength over 300lb. to the square inch.

TESTED AND CERTIFIED by the BRITISH FIRE-PREVENTION COMMITTEE.

PASSED by the L.C.C.

Fire and Damp Resisting.

Germ and Sound Proof.

Non-conductor of heat or cold.

Sanitary.

Over 5,000,000 (five million) Square Feet in use by H.M. Government.

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London Retail Depôts:
61 Endell St., W.C. Telephone: Gerrard 2519.
64 Wardour St., W.
13 Greek St., W. Telephone: Gerrard 2[illegible].
59 Mount Pleasant, W.C. Telephone: Holborn 522[illegible].

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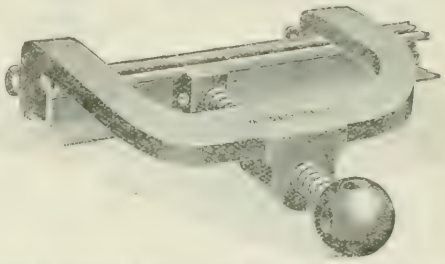
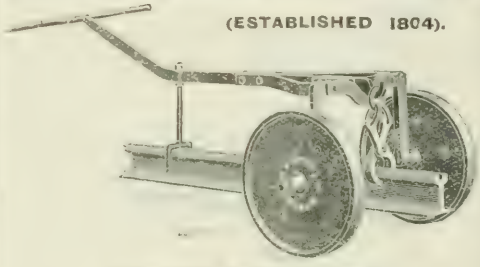


TRAMWAY AND OTHER TOOL MANUFACTURERS

(ESTABLISHED 1804).



WRITE ASTON MANOR, BIRMINGHAM.
WIRE — "YATONIAN, BIRMINGHAM"
'PHONE - EAST 400, 401 and 402
(Private Branch Exchange).

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LTD.

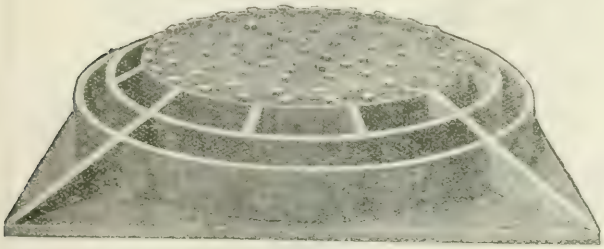
CARLTON ENGINEERING WORKS,

HIGH ROAD, TOTTENHAM, LONDON

'Phone, Tottenham 2048 Wires,—"A[illegible], Tottenham, London."

THE "GRIP" PATENT MANHOLE COVER.

Rounded edges avoided. A depth of 5in. of macadam gripped around the outer frame of the cover by the concentric rings shown.



SEWERAGE IRONWORK.

AS will be seen from the photograph, the concentric rings which form an integral part of the frame provide annular spaces in which the road material is not only held up, but becomes more and more consolidated in these spaces as it is compressed by the traffic. This has the effect of reducing the crumbling of the road material, and its wearing away from the vertical edge of the frame.

But road material will wear away eventually, and when it does the "GRIP" cover provides against the danger of abrupt edges. The concentric rings are graded in height, and if the road above them becomes worn they provide an inclined plane to the edge of the frame. It will be seen that we have avoided rounded edges, because with a curved edge the road material becomes so thin at its point of contact with the iron that it can only last for a very short time, and when it has worn a depression is left between the road surface and the iron, which is dangerous.

AUTOMATIC SYPHONS, DISC VALVES, FLAP VALVES, VENT COLUMNS, PENSTOCKS.

HALIFAX.—July 1st.—For the supply of electricity plant, for the Electricity Committee.—Mr. W. M. Rogerson, borough electrical engineer.

LLANDILOFAWR.—July 2nd.—For the construction of water supply works, for the rural district council.—Mr. E. Jones, surveyor, Glancennen, Llandebie.

ERITH.—July 5th—19th.—For the supply of electricity plant, for the urban district council.—Engineer and Manager, Electricity Works, Walnut Tree-road, Erith.

DUNDALK.—July 5th.—For sinking a well and erecting a pump, for the rural district council.—Mr. Cahil, Council Offices.

WITHERNSEA.—July 6th.—For the supply and laying of water mains, for the urban district council.—Mr. J. B. Kirton, engineer, Council Offices.

MADRAS.—July 14th.—For the supply of cast-iron pipes, special castings, sluice valves and hydrants, for the corporation.—Mr. J. W. Madeley, special engineer; agents, Messrs. James Mansergh & Sons, 5 Victoria-street, Westminster, London, S.W.

RANGOON.—August 11th.—For the installation of a system of fire alarms, for the municipality.—Messrs. Ogilvy, Gillanders & Co., 67 Cornhill, London, E.C.

Roads.

BROWNHILLS.—June 28th.—For tar-spraying 35,000 super. yds. of road and tar grouting, for the urban district council.—Mr. J. H. Shaw, engineer and surveyor.

CHORLEY.—June 28th.—For works of widening and improvement, for the rural district council.—Mr. P. Whalley, highway surveyor.

SKELTON.—June 30th.—For making up back streets, for the urban district council.—Mr. A. R. Cranmer, surveyor, High-street, Skelton-in-Cleveland.

BASINGSTOKE.—June 30th.—For steam rolling, for the rural district council.—Mr. R. Forrester, surveyor, Chequers-road.

MANCHESTER.—July 1st.—For repaving at Campfield market, for the Markets Committee.—Mr. Thomas Hudson, town clerk.

HARROW.—July 3rd.—For the supply of broken granite, gravel, tarred granite or slag, and tarred granite or slag chippings, for the urban district council.—Mr. J. P. Bennetts, surveyor.

SHEFFIELD.—July 3rd.—For laying about 1,900 yards of creosoted wood paving, the price to include seven years' free maintenance, for the corporation.—Mr. W. J. Hadfield, city surveyor, Town Hall.

HUYTON.—July 3rd.—For paving work with granite setts, for the urban district council.—The Surveyor.

WELLINGBOROUGH.—July 3rd.—For the supply of granite, granite treated with Bi-tarco, limestone, limestone chippings, and patent paving slabs, for the urban district council.—Mr. J. T. Parker, clerk, 29 Church-street, Wellingborough.

COTTINGHAM.—July 5th.—For the supply of broken whinstone, granite, and screened chippings, for the urban district council.—Mr. J. H. Hanson, surveyor.

COALVILLE.—July 5th.—For making up and sewering part of a street, for the urban district council.—Mr. L. L. Baldwin, surveyor.

HALE.—July 7th.—For making up back passages, for the urban district council.—Mr. T. Blagburn, surveyor.

PONTEFRACT.—July 7th.—For team labour and the erection of creosoted wood fencing, for the rural district council.—Mr. J. P. Senior, surveyor.

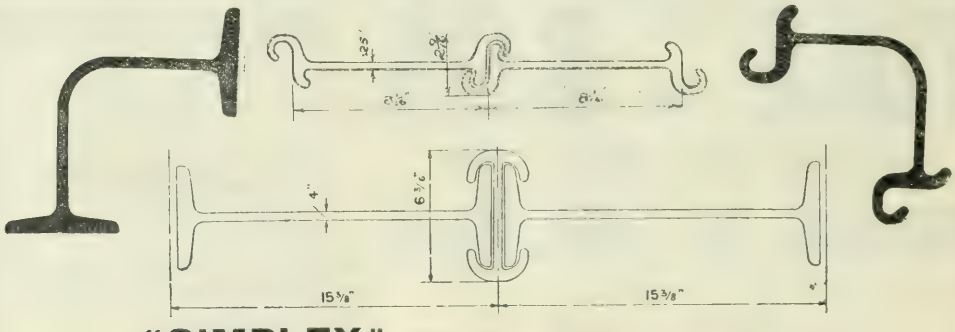
BEDS.—July 7th.—For work of tar-painting and repairing, for the Education Committee.—Mr. R. K. Ellison, surveyor, Shire Hall, Bedford.

HASTINGS.—July 9th.—For steam rolling work, for the rural district council.—Mr. J. Standen, district surveyor, Ivy House-lane, Ore, Hastings.

LEES.—July 10th.—For asphalting a footpath, for the urban district council.—The Surveyor, Council Offices, Cross-street, Lees, Lancs.

Sanitary.

BROWNHILLS.—June 28th.—For laying 9-in. stoneware pipe sewer, for the urban district council.—Mr. J. H. Shaw, engineer and surveyor.



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FINCHLEY.—June 28th.—For the erection of a public convenience and the construction of humus tanks, for the urban district council.—Mr. C. J. Jenkin, engineer and surveyor.

MANCHESTER.—July 2nd.—For the execution of sanitary alterations, for the corporation.—Manager, Drainage Department.

SLIGO.—July 3rd.—For the construction of drain or sewer, for the rural district council.—Mr. M. F. Coulon, clerk, Court House, Sligo.

NEWPORT (I.W.).—July 5th.—For the removal of house and road refuse, for the corporation.—Mr. T. Ross Pratt, town clerk.

VENTNOR.—July 7th.—For the collection and disposal of house refuse, for the urban district council.—Mr. H. H. Oakes, clerk, Town Hall.

SMALLBURGH.—July 15th.—For work of scavenging, for the rural district council.—Mr. F. Davies, clerk, North Walsham.

ETON.—July 19th.—For scavenging work, for the rural district council.—Mr. C. P. Summerhayes, Fairview Villas, Colnbrook.

HOWDEN.—For laying sewer and manholes, for the rural district council.—Mr. T. Dinsdale, Hailgate, Howden.

BILLERICAY.—For the collection of house refuse, for the rural district council.—Mr. S. J. Shelley, Junction-road, South Weald.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

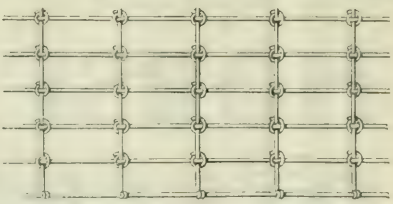
The Editor invites the co-operation of Surveyor *readers with a view to making the information given under this head as complete and accurate as possible.*

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

DERWENT.—For the erection of a stable and coach-house at the small-pox hospital, for the Joint Small-pox Hospital Board.—Mr. H. B. Williams, architect:—

T. Johnston, Workington	£280
T. Wilkinson, Workington	276
J. Douglas, Workington	272
L. Ferguson & Sons, Workington* ..	266

Architect's estimate, £268.



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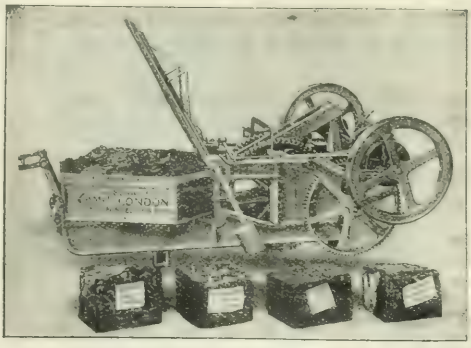

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